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No. 4—The Application of Vaccine Therapy*

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Since many of the discoveries in bacteriology and immunity have been intimately associated with animal experimentation, it is not inappropriate that the lower animals should benefit materially from the knowledge thus gained. As a consequence vaccine therapy, both prophylactic and therapeutic, is being increasingly employed in veterinary practice. In view of the great amount of work being carried out in the subject of immunology and the vastness and general inaccessibility of its literature, the general practitioner has a right from time to time to ask of the workers in this field what advances in the prophylaxis and treatment of infective diseases have resulted—advances so generally accepted as to be reasonably considered permanent, and which he must, therefore, be prepared to use in his practice. I am not competent to present adequately all the recent advances in this branch of science but my shortcomings may stimulate in the reader a desire to contribute to the discussion. This paper deals, briefly, with the general principles employed in assessing the value of prophylactic vaccines in the control of infective disease. As examples, reference has been made to some of the standardised vaccines in modern use. The urgent need, in this country, for State control over the standardisation of all biological products for veterinary use is emphasised.

VACCINE THERAPY *versus* OTHER METHODS FOR THE CONTROL OF INFECTIVE DISEASE

In the war against infective disease of animals three main methods of attack may be adopted either singly or in combination—one represented by the geneticist who seeks to breed a population naturally resistant to the particular disease; a second represented by the hygienist and sanitarian who, often aided by legislation, seeks to shield the population from contact with or exposure to the infective agent, and a third represented by the immunologist who seeks to render the individual animal or herd resistant to the infective agent by vaccination. During the past century marked advances in the control of infective disease in animals have been made. In this country, those that spring at once to mind are bovine pleuropneumonia, rinderpest, sheep-pox, glanders, rabies, blackleg, braxy, lamb dysentery, dog distemper, louping-ill, etc. Leaving aside the method of the geneticist the results of which we must still await, if we endeavour to place the other methods in order of merit for their past accomplishments, probably the highest award would go to the hygienist and sanitarian. His method insists on the segregation of infected from healthy animals, quarantine and examination of imported animals and the stamping out of fresh centres of infection by slaughter of diseased animals. Next in order would be the immunological method which, although only of recent general application, has accomplished some remarkable achievements in the control of infective disease. Present evidence, indeed, suggests that the outstanding advances of the future will come more from the immunologist than from the hygienist and sanitarian.

As examples of the combination of immunological or bacteriological methods with hygienic methods for the control of infective disease we might instance the segregation schemes for the control of tuberculosis, contagious abortion and more recently, the experimental work in the control of mastitis in cattle. While these methods have much to commend them, especially that for the eradication of bovine tuberculosis, there is likely to be further controversy before we arrive at an evaluation of their true merits. The present tuberculosis regulations, aiming as they do at the protection of public health, by the elimination of clinical cases of the disease, may eventually do much to slow down the spread of infection, and with a slower

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rate of spread, eradication by segregation would become progressively more encouraging. Though such a policy may, with time, prove its worth for bovine tuberculosis eradication, the same may not prove of practicable application in the control of bovine abortion and mastitis. Each of these diseases is, more or less, widespread in this country and both, in my experience, are liable to spread within a herd more readily than tuberculosis. Even the owner who has accomplished the expensive and arduous task of eradicating abortion and mastitis from his herd of cows, finds his animals in imminent danger of reinfection so long as these diseases continue to exist in the dairy herds surrounding him. Though one can almost hear the sardonic comment of the epidemiologist while we continue to pursue these difficult and costly schemes of eradication, it seems that there is no alternative, unless in the future ways and means of rendering cattle resistant to these great scourges, by immunological methods, can be found.

The Preparation of Vaccines

Pasteur's work with living attenuated vaccines ushered in the modern era of prophylactic vaccination and his practical demonstration at Pouilly le Fort left no question as to its efficacy. This was followed by the preparation and trial of dead vaccines and many modifications and varieties in the methods of vaccine production have since been evolved. The quality of safety attending the application of dead vaccines always makes a stronger appeal for the use of these in preference to attenuated, avirulent, or living vaccines. The simple vaccine is a suspension of the bacteria prepared from a pure culture rendered innocuous by heat just sufficient to kill the organisms. In the case of organisms which produce an exotoxin it has been found that formalin is capable of destroying the toxic properties while the antigenic power is retained. The formolised toxin is known as toxoid. The same principle has been applied to whole cultures mainly in the production of vaccines from the toxicogenic anaerobes. Broth cultures of the organism are incubated with about 0·5 per cent. of formalin. This procedure renders the vegetative bacteria innocuous and converts the toxin into toxoid. Good examples of this type of vaccine are braxy vaccine and lamb dysentery vaccine. Formolised vaccines for the prevention of virus diseases have recently been introduced, *e.g.*, dog distemper vaccine which is a formolised saline emulsion of infected dog spleen and louping-ill vaccine which is a formolised saline emulsion of infected sheep brain, spinal cord and spleen. An autogenous vaccine is one prepared from cultures of the particular microbe which is infecting an individual animal and is used for the treatment of that individual. A stock vaccine is intended for use in animals other than those from which the culture was obtained. Although many modified methods of preparing vaccines are in use, the examples described above form the basis on which the variations are made.

It is an important principle in vaccine production that a recently isolated strain of the microbe be selected, since it is becoming increasingly obvious that after long subcultivation some organisms lose antigens which they possessed when isolated originally. This is an aspect in the standardisation of vaccines that will require closer attention than it has received in the past.

Assessing the Prophylactic Value of Vaccines

In veterinary preventive medicine we have a means of assessing the value of vaccines which is not so readily available to our colleagues in human medicine. We may apply the new prophylactic to each alternate animal so that eventually we obtain a large number of vaccinated and an approximately equal number of controls. If these animals are kept under the same conditions and all are exposed to the same risk of natural infection we can assess with reliance the true value of the prophylactic by comparing the morbidity or mortality rate in each of the two groups. Though there may be excellent reasons for believing that a particular vaccine will prevent a particular disease the final assessment of its true value must always be determined by clinical results.

It will be useful to consider here a few illustrative examples drawn from recent methods which have been employed in assessing the value of prophylactic vaccination in the control of animal disease.

Braxy Vaccine.

After a bacteriological investigation of braxy in sheep Gaiger (1922) concluded that the cause of death in this disease was *Cl. septique*. Though he could not satisfy Koch's postulates regarding this conclusion because he never succeeded in reproducing a case of braxy by feeding sheep with *Cl. septique*, yet his conclusion was ultimately justified by the fact that the establishment of a good immunity in sheep against *Cl. septique* prevented death from this disease. Gaiger's vaccine consisted of a filtered broth culture of *Cl. septique*, *i.e.*, toxin. This material if injected into sheep in the unaltered state would have caused serious local reaction and death of the animal. To overcome this difficulty Gaiger diluted the toxin with saline until it could be injected with a fair degree of safety into a large number of animals. At this stage it might have been assumed that the work was finished but, just as Pasteur did with anthrax vaccine, so did Gaiger subject his

vaccine to field trial and on farms where vaccine was used a number of animals were always left untreated. His preliminary results, with many hundreds of animals, showed that a death rate of 2·39 per cent. could be expected in the vaccinated animals while a 9 per cent. death rate occurred in the controls. This result did not complete the investigation because, in bulk production, great difficulty was experienced in standardising the vaccine so that it was safe for use and at the same time capable of protecting the animal. The first improvement in production was effected by Allen and Bosworth (1924) and continued by Dalling, Allen and Mason (1925). These authors adopted a vaccine which comprised a mixture of *Cl. septique* toxin with its specific antitoxin. In this method by means of laboratory tests it could be determined how much antitoxin was necessary to neutralise a given quantity of toxin, and the vaccine employed was a 50 per cent. underneutralised toxin-antitoxin mixture. Before this vaccine was allowed to replace the old type of vaccine it was submitted to field trial and table I illustrates the exacting test which it had to survive before being adopted.

Table I.

Field Trial of Toxin-Antitoxin Mixture for the Prevention of Braxy.

Farm.	Inoculated.	Deaths.	Per cent.	Control.	Deaths.	Per cent.
1	60	2	3·3	60	6	10·0
2	180	0	—	120	7	5·8
3	20	0	—	12	2	16·6
4	80	0	—	80	14	17·5
5	70	0	—	80	5	6·2
6	39	0	—	12	6	50·0
7	100	0	—	100	32	32·0
Total	549	2	0·37	464	72	15·5

With the progress in immunological science toxin-antitoxin mixture was eventually replaced by formolised culture of *Cl. septique*. This vaccine was preferred because it produced less reaction in inoculated animals and in addition it was much more easily prepared in large quantity. Again before this new vaccine was released for general use it was subjected to field trial and table II exemplifies one of our own experiments in this connection.

Lamb Dysentery Vaccine.

To illustrate another aspect in the standardisation of vaccines let us turn to Dalling's lamb dysentery vaccine. This product is a formolised culture of *Cl. welchii*, type B, which is used for the production of active immunity in pregnant ewes. The mother in turn transmits a passive immunity to her lamb in virtue of anti-

Table II.

Field Trial of Formolised Culture for the Prevention of Braxy.

Farm.	Inoculated.	Deaths.	Per cent.	Controls.	Deaths.	Per cent.
1	49	0	—	49	6	12·2
2	100	0	—	50	7	14·0
3	369	0	—	372	46	12·3
4	71	2	2·8	69	5	7·2
5	60	0	—	60	2	3·3
6	425	2	0·5	425	28	6·5
7	90	0	—	90	5	5·5
8	150	0	—	150	7	4·6
Total	1,314	4	0·3	1,265	106	8·3

toxin which at first is highly concentrated in the colostrum. The immunising value of each batch of vaccine prepared is assessed according to its capacity for immunising laboratory animals such as guineapigs or rabbits. If the product is capable of immunising practically 100 per cent. of the test animals against lamb dysentery toxin it is satisfactory for issue, but if it fails to reach this standard it is discarded. An example of such a test is shown in table III (*overleaf*).

When this vaccine was passing through its experimental trials before being issued for general use it was subjected, like braxy vaccine, to exacting field tests and it was not considered to be satisfactory until it had passed these trials in several consecutive seasons. Table IV is typical of the results of these tests.

Table IV.

Field Trials of Lamb Dysentery Vaccine.

Year	1927		1928	
Lambs born from vaccinated ewes	4,140		6,681	
Deaths from lamb dysentery	36	0·9%	59	0·9%
Lambs born from control ewes	2,213		5,029	
Deaths from lamb dysentery	178	8·0%	761	15·1%

Such methods of assessing the prophylactic value of a vaccine leave no room for doubting its efficiency for the control of the naturally occurring disease. Even these precautions do not end the watchfulness and care which have to be exercised over the production of biological products. The characters of the strain of organism employed in making the vaccine must be carefully studied. Thus the typical lamb dysentery organism produces three main types of toxin to which we will refer as A, C and D, respectively. Each of these toxins is a separate

Table III.

Assessment of the Protective Value of a Lamb Dysentery Vaccine in Guinea Pigs.
A few hours elapse between each test injection, but all are completed within 24 hours.

Vaccinated Guinea Pigs.	One Lethal Dose of L.D. Toxin.	Three Lethal Doses.	Four Lethal Doses.	Eight Lethal 3oses.	Sixteen Lethal Doses.	Degree of Immunity in Terms of Lethal Doses.
1	L	+				1 < 4
2	L	+				1 < 4
3	L	+				1 < 4
4	L	L	L	+	+	8 < 16
5	L	L	L	+	+	8 < 16
6	L	L	L	L	+	16 < 32
7	L	L	L	L	+	16 < 32
8	L	L	L	L	L	> 32
9	L	L	L	L	L	> 32
10	L	L	L	L	L	> 32
11	L	L	L	L	L	> 32
12	L	L	L	L	L	> 32
Control Guinea Pigs.						
1	+					Nil
2	+					Nil
3	+					Nil
4	+					Nil
5	+					Nil
6	+					Nil

antigen and the vaccine prepared from such a strain produces antibody in the inoculated animal to A, C and D toxins. In the course of subcultivating his original strain Dalling found that it eventually lost the capacity to produce the type D toxin and consequently vaccine made from the organism at this stage lacked one of its important antigens. From this it may be inferred that had not this change in the character of the organism been detected quickly, the vaccines issued to-day would have been deficient in protective power. Another illustration of the loss of an antigen after artificial subcultivation of an organism has been described in human preventive medicine. Thus Grinell (1932) pointed out that nearly all the anti-typhoid vaccine prepared in the United States had been made from one strain of typhoid bacillus (Rawlings strain), which was originally isolated by Sir Almroth Wright in 1900. This bacillus had, therefore, been grown in artificial medium for over 30 years. Grinell obtained twelve cultures of this strain from different laboratories and vaccines were made from all the "Rawlings" and from a recently isolated strain. Mice were immunised with these vaccines and then tested by injecting them with the recently isolated strain. The mice which had received the "Rawlings" vaccines showed no protection—the death rate (87 per cent.) was the same as in the non-immunised animals—but of those which had received the vaccine made from the recently isolated culture only 3 per cent. died. As Fleming and Petrie (1934) point out, the inference is that most of the antityphoid vaccine used in the United States in recent years has been deficient in protective power.

Louping-ill Vaccine.

Louping-ill, an encephalomyelitis of sheep, is caused by a filterable virus possessing neurotropic characters. Under natural conditions of infection the disease is tick-borne, the vector being *Ixodes ricinus* L. When sheep become infected with this disease the virus multiplies in the first instance in the blood and at a late stage in the infection invades the brain and spinal cord causing an encephalomyelitis which is responsible for the typical symptoms of nervous derangement in this disease. The vaccine which we have adopted for the control of louping-ill is prepared on the same lines as that introduced by Laidlaw and Dunkin for the control of dog distemper. It consists of a formolised emulsion of the brain, spinal cord and spleen taken from sheep which have been infected by injection with virus intracerebrally. In assessing the potency of this vaccine before issue we inoculate ten sheep subcutaneously with vaccine and 14 days later the vaccinated sheep and five controls are given a test dose of virus subcutaneously. If the vaccine is up to standard the vaccinated sheep remain healthy while the controls develop a louping-ill infection. Before it was released for general use, louping-ill vaccine was subjected to extensive field trials and these have proved its efficiency for the control of the naturally occurring disease. Table V (*overleaf*) illustrates the result.

Table V.

Field Trials of Louping-ill Vaccine.

Year	1931		1932		1933		1934	
Number of sheep vaccinated	455		1,172		5,202		5,013	
Deaths from louping-ill...	3	0·66%	10	0·85%	50	0·96%	15	0·3%
Deaths from all causes					129	2·45%	57	1·14%
Number of controls	381		1,208		5,396		4,931	
Deaths from louping-ill...	30	7·87%	88	7·28%	237	4·39%	262	5·31%
Deaths from all causes					352	6·52%	379	7·69%

The above-mentioned vaccines have been discussed in some detail to illustrate different aspects of the standardisation of vaccines. There are many other vaccines in use in this country which are accurately standardised and for which there is satisfactory evidence in the records as to their efficiency in practice but it is only possible here to refer briefly to some of these.

Swine Erysipelas.

The method of sero-vaccination for the prevention of swine erysipelas is probably the most satisfactory. In this a freshly prepared mixture of hyperimmune serum and a culture of *Erysipelothrix rhusiopathiae* is administered, followed a fortnight later by a dose of culture alone. The resultant immunity lasts from four to five months.

Blackleg.

The introduction of formolised culture vaccine of *Cl. chauvoei* by Leclainche and Vallée constitutes an important advance in blackleg immunisation. This vaccine has been used for the protection of animals in affected districts and has been found to be both safe and efficient. Its immunising value, as has been demonstrated experimentally by several independent investigators, would appear to be higher on the average than that of aggressin. It combines the antigens contained in the dead organisms with those of aggressin. A good review of this subject is given by Bosworth (1930).

Tetanus.

Two injections of toxoid prepared from tetanus toxin are capable of producing a good immunity in horses against tetanus. Though the method is not in general use in this country it could probably be usefully employed in districts where tetanus is prevalent.

Dog Distemper.

The evidence in favour of the value of dog distemper vaccine as introduced by Laidlaw and Dunkin and continued by Dalling is conclusive. The vaccine consists of a formolised 20 per cent. saline emulsion of the organs of experimentally infected dogs. This is followed 14 days later by a small dose of living virus contained in the dried spleen of infected ferrets. A more popular method, on account of its convenience, recently introduced is the "virus-serum" method and Dalling (1934) recommends the inoculation of virus first followed one hour later by a hyperimmune serum which has been prepared in dogs.

Fowl Pox.

This disease of poultry is caused by a filterable virus which may give rise to a variety of lesions. In some cases nothing more than a simple coryza of the nose and eyes occurs but generally lesions are found in the mouth, throat, wind-pipe, comb, wattles and unfeathered parts of the body. Doyle (1930) showed that pigeon pox virus confers upon fowls a solid immunity against the natural infection with fowl pox. This method is now being extensively employed in this country and has brought about a rapid and substantial reduction in the incidence.

The Value of Vaccines in the Treatment of Disease

We have just seen that in veterinary medicine we have an excellent opportunity of assessing the prophylactic value of vaccines, mainly because of the fact that we are able to employ groups of control animals. When we turn from prevention to the cure of an established infection we are faced with a much more difficult task in the assessment of the value of vaccines. Admittedly, vaccines both specific and non-specific have been used in the treatment of chronic conditions like fistulous withers, catarrh, strangles, mastitis, interdigital cysts, joint-ill, etc., but the reports of their efficiency are conflicting. Probably the most suggestive evidence of the efficacy of a vaccine in treatment has recently been furnished by the use of staphylococcal toxoid in the treatment of chronic staphylococcal infections in man. It has been indicated by Minett (1937) that he intends to follow up this line of enquiry in its application to animal disease and his work in this connection will be followed with great interest.

The laboratory worker must pay a profound tribute of respect to the achievements of the clinician in the face of immense difficulties in trying to assess the value of vaccines in the treatment of disease. This, however, must not allow us to lower the standard of evidence we ask before we are convinced. Just as we had to proceed by statistical methods in assessing the prophylactic value of vaccines so must we apply similar methods in determining the curative value of vaccines, and the conflicting evidence on this subject indicates that the practice of vaccine therapy rests on a very inadequate basis of experimental evidence. If, however, it can be justified on a basis of clinical experience then its value cannot be disputed and for this we look to the clinician to furnish the evidence.

The Need for State Control over all Biological Products for Veterinary Use

The important subject of standardisation of veterinary biological products occupied the attention of the International Veterinary Congress which was held in London, in 1930, and important reviews were contributed by Eichhorn of New York, Mohler of Washington, and Flueckiger of Berne. The information given by Eichhorn and by Mohler conclusively proves the necessity for legislative control of the preparation of sera, vaccines and diagnostic agents for veterinary purposes. Since the enactment of the Virus Serum Toxin Law in America the production and standardisation of biological products has been under State control. The report by Mohler is a revelation of the chaos that existed prior to this law. Normal serum derived from animals slaughtered for food purposes was sold as anti-swine fever serum, lymph for small pox vaccination was found to be contaminated with the virus of foot-and-mouth disease. A serum widely advertised for the prevention and cure of abortion in cattle was found to be a weak solution of carbolic acid. Diphtheria antitoxin which had been returned to the producer because its date of usefulness had expired, was relabelled and issued as antitoxin for equine influenza, fowl pox, dog distemper, etc. Tetanus antitoxin was in some instances about two-thirds less than the strength the product should have possessed, and so on.

In this country there are many biological products on the market and little attempt has been made on our part to assess the potency and purity of these products. There are, however, two recently recorded instances and in each the product concerned was lamb dysentery serum. Thus, we had occasion to enquire into a serious outbreak of lamb dysentery on a farm where serum produced by a certain manufacturer, and labelled "Lamb Dysentery Serum," was being used (Gordon, 1934). The serum was tested and was found to possess no detectable lamb dysentery antitoxin. Montgomerie and Rowlands (1936), tested five commercial brands of "Lamb Dysentery Serum," two of British and three of foreign origin. Their work shows conclusively that three of the five brands tested were quite unsuitable for the control of lamb dysentery. At Moredun Institute we have recently been studying *Br. abortus* infection in laboratory animals. In the course of this work, which will be published in detail later, we have tested a number of dead vaccines prepared from *Br. abortus* for their value in the immunisation of guinea pigs against one infective dose of culture. Amongst these vaccines six at present widely advertised for sale in this country were found to be valueless for the protection of guinea pigs. Huddleson (1924) after completing work of a similar nature in the United States made the following comment: "The worthlessness of a killed vaccine in protecting the guinea pig . . . should furnish enlightenment on the same agent now being advocated for use in the bovine by some of our prominent biological manufacturers."

The Therapeutic Substances Act, 1925, came into being for the control of the manufacture for sale, and the importation of therapeutic substances intended for use in human medicine. After ten years had passed similar provision was made, under Part II of the Diseases of Animals Act, 1935, in respect of therapeutic substances intended exclusively for veterinary use. In the first schedule of this Act therapeutic substances are defined as vaccines, sera, toxins, antitoxins and antigens. The manufacturer of biological products is the important link between advances in immunological science and the fruits of their practical application. He serves a most important need in the community and the value of his services could be placed in a position beyond criticism by an early application of the Diseases of Animals Act, 1935.

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The foregoing paper was discussed by the Experimental Pathology Section in the Grand Hall, Town Hall, Bournemouth, at ten o'clock on Wednesday, July 28th, 1937, when there was a good attendance of delegates.

The PRESIDENT of the Section (Mr. C. V. Watkins) promptly called upon Dr. Gordon to make any introductory observations that he desired to the discussion on his paper that was to take place that morning.

Introducing his paper, Dr. GORDON said the scope of the subject was wide and he had dealt only with those aspects which appealed to the immunologist, particularly with regard to the standardisation of vaccines. When the specific cause of an infective disease had been established and when it had been proved by carefully controlled experiments that a vaccine prepared from the causal organism produced a good immunity to the naturally occurring disease, then that vaccine could be said to have reached a stage of usefulness for the control of the disease in question. As he had indicated in his paper, there were a number of vaccines which had reached that stage of efficiency but the question was whether all the vaccines at present on the market conformed to that standard. There was evidence accumulating from a number of different sources, to suggest that certain vaccines and sera at present on the market were valueless for the purpose for which they were intended. He did not wish to condemn the manufacturer of biological products for he served a most important need in the community as the link between advances in immunological science and the points of their practical application. But he felt that no time should be lost in bringing legislation into being for the purpose of controlling the potency and purity of all biological products for veterinary use. (Hear, hear.)

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Discussion

Captain S. J. MOTTON, F.R.C.V.S., opening the discussion said:—

I very much appreciate the honour of being asked to open this discussion. Dr. Gordon deserves our very sincere thanks for undertaking the production of the paper at a period when the demands on his time were already very great. I am grateful to him for sending me an advance copy.

When the question of an opener of the discussion was under consideration, it was thought that a practitioner would be the proper person for the task. I had considerable doubt about that aspect of the matter then, very largely because it occurred to me that, especially in connection with curative vaccines, the average practitioner has difficulty in finding adequate controls. An attempt to produce a useful opening of the paper has convinced me that I have tackled a difficult problem.

It is possible that, after struggling without success for long periods, in the treatment of a given type of case, one may adopt a curative vaccine treatment and failures may then disappear. The discussion may reveal numerous instances of this kind, but it has not been my good fortune to obtain very convincing results from the use of such vaccines.

This paper would have been very disappointing if one had harboured visions of the release of valuable information relating to the curative value of vaccines. It is a valuable paper because it will give clinicians an opportunity to relate their failures, and because Dr. Gordon has emphasised three points of very serious importance. They are:—

(1) The need for adequate control of the production and marketing of biological products.

(2) The proved value of certain prophylactics.

(3) The fact that accurate knowledge of the curative value of many vaccines lies in an undiscovered country.

Dr. Gordon indicates the limitations of the geneticists, the hygienists and sanitarians, and there is a temptation here to be led away from the title of the paper, but I will not stray.

As long as the free use of fire-arms is permissible hygienists and sanitarians can control and/or wipe out disease. It is a valuable method, but this line has a limit when we consider its

application to the control of diseases like tuberculosis, Johne's disease, contagious abortion and mastitis.

Dr. Gordon mentions the danger attaching to the risk of disease being reintroduced after an owner has eliminated it by segregation methods. We know quite well that, given time, money, and suitable premises, most of these diseases can be eliminated by the use of various tests, isolation and/or disposal of the affected animals, but I am convinced that until it is possible (and it may never be) to brand and control positive cases of these diseases, very little progress will be made in the reduction of the number of cases in a country. Dr. Gordon's remarks in this connection strongly suggest that great difficulties stand in the way of elimination unless the immunologists can pull something from their sleeves. But can they? Dr. Gordon is rather silent in connection with vaccination against tuberculosis and contagious abortion. Is this because he thinks they are both dreams unlikely to be realised?

When one thinks of vaccine therapy there is a temptation to think of vaccines and sera at the same time, and in veterinary practice simultaneous methods are used sufficiently often almost to render this justifiable. However, the title of the paper is "The Application of Vaccine Therapy," and as far as possible the author has adhered religiously to it.

Fleming and Petrie, in their book on "Recent Advances in Vaccine and Serum Therapy," find it necessary to define "antigens" and "antibodies," and perhaps you will permit me to quote them. They say, "When we speak of antigens we mean a group of substances of bacterial or viral origin which, as the result of their introduction into the living tissues of animals give rise to antibodies that are capable of reacting *in vitro* or *in vivo* with the corresponding antigens. For example, a dose of an appropriate antibody will protect a susceptible animal from illness and death when many multiples of the lethal dose of a toxin or a highly virulent bacterium are administered to it. The efficacy of vaccine preparations depends upon their antigenic components, and sera owe their therapeutic activity to the antibodies, whether anti-toxic, or anti-bacterial or anti-viral, that they contain."

Some time ago a writer in the *Journal of the American Veterinary Medical Association* classified vaccines somewhat as follows: (1) Good; (2) Experimental, and (3) Useless. Dr. Gordon has described some good vaccines. They are all prophylactic. Into one group he bunches vaccines used in the treatment of "chronic conditions like fistulous withers, catarrh, strangles, mastitis, interdigital cysts, joint-ill, etc." I am not sure that the use of vaccines is confined to the treatment of chronic cases of all of these conditions. His view appears to be that they belong to the experimental and/or useless groups.

He has complimented clinicians on their achievements in trying to assess the value of vaccines in the treatment of disease. But have we really achieved very much? We are often very much like men looking for a black hat in a dark room. The author has indicated only too clearly how often we work in a territory full of booby traps. He has quoted Eichhorn's disclosures with regard to "dud" biological preparations in America, and he has added to our discomfort by telling us of half a dozen widely advertised dead Brucella vaccines which contain no immunising properties. To those who use dead Brucella vaccine it is a little disconcerting to know that they may have been using one of these, and it is worse still if they have persuaded themselves that a decrease in the incidence of abortions has resulted from their use. Those who object to the employment of living Brucella vaccine may think this is a blessing in disguise, and that the inert vaccine can at least have done no harm. We may wonder how many more so-called vaccines, which fall in the same category, are available to us.

But that is not all of the trouble. We may not find ourselves entirely in agreement with the views expressed by Sir John McFadyean in the *Journal of Comparative Pathology*, March, 1933, but he gives some very good reasons why the opinions of practitioners are likely to be wrong in connection with the use of living Brucella vaccines. If my memory is not at fault, however, when the Board of Agriculture first issued vaccines for the control of contagious abortion, a dead and a living vaccine were issued. Later the dead preparation was discontinued. The inference would appear to be that the living material was giving better results than the other. It is unfortunate that, even if living vaccine is found to be the best way of controlling the disease, our difficulties are increased by the fear that milk from vaccinated animals may add to the risk of drinking milk—that food which we are told is so dangerous and of which we are at the same time advised to drink more. Perhaps, if the question of pasteurization eventually settles in favour of the process, one of the worries of practitioners may cease.

In practice the practitioner is the buffer between the laboratory and the public.

The use of vaccines is controlled by several factors among which are: (1) The owner wishes to be assured that there is no risk to the animals from the vaccine itself, either in respect of blemish or death.

(2) We are asked, will the vaccine lead to diminution in milk yield, will the milk be temporarily unfit to sell, and will there at any stage be an objection to the slaughter of a food animal for human consumption?

(3) We are asked how near to 100 per cent. the vaccine is efficient.

(4) And then there is the question of cost. With regard to the first point, blemish is always a possibility. Living Brucella vaccine will sometimes cause a cold abscess, and at others it will give rise to a large fibrous mass which is difficult to dissect out even a year later. Whether this is due to some fault in the vaccine, or whether it is a reaction on the part of an already infected animal, I do not know. The largest fibrous masses which I have seen resulted from vaccine from one source. I have heard of, but have not seen, changes in the colour of the coat at the sites of the injection of canine distemper vaccine.

The question of the fitness for human consumption of milk or flesh from recently vaccinated animals may be an easy one for the laboratory worker to answer, but it is not so easy for the practitioner. I think it might be useful if the makers of vaccines for food and milch animals, sent out a statement with their products covering this point.

Anthrax vaccine is not often used in this country, but it is occasionally employed. Fleming and Petrie refer to the use of attenuated anthrax vaccines in animals, and they say there have been many instances in which animals contracted the disease as the result of the inoculation. In 1929, I used Pasteur's double vaccine. Possible danger from the ingestion of the milk or meat from the vaccinated animals exercised my mind. The agents who supplied the material wrote me as follows: "With reference to your questions regarding Pasteur anti-anthrax vaccine, we have now received a reply from the Director of the Pasteur Laboratory giving the following answers: (1) and (2) Animals may be killed at any time after anti-anthrax inoculation, whether first or second injections (even 24 hours after). Anti-anthrax vaccination does not render animals unfit for human consumption. (3) Milk from cows recently vaccinated is quite suitable for human consumption; the quantity of the milk yield may diminish for one or two days, but the quality is not altered. In short, anthrax vaccine has at no time any adverse effect upon either meat or milk." What does Dr. Gordon think about this?

Dr. Gordon makes a fleeting reference to swine erysipelas and to the simultaneous method of immunisation. May we assume that he would use this method only where trouble is anticipated, and not at the height of an outbreak? What is the effect, if any, of this vaccine on the carcases of pigs in relation to meat inspection?

With regard to the immunisation of dogs against distemper, few will quarrel with the conclusion that the Laidlaw-Dunkin method will usually immunise dogs, but what, if any, is the mortality from the vaccine and what is the percentage of break-downs in immunity? If there are no risks and no disappointments, why, aside from the question of convenience, the variations from the original method in the marketed material, and why the variations practised in respect of the time which elapses between the injection of virus and serum? A word of warning here may not be out of place. When the virus serum method is being employed it is advisable to have a spare dose of serum on the spot. It would be awkward to have an accident with the serum so that it could not be injected after the virus is in the dog. To what extent is a vaccinated dog infectious to susceptible dogs? What is the lowest weight dog which Dr. Gordon would subject to this method of vaccination?

Reference to stock and autogenous vaccines for curative treatment has been made in the paper. The former are ready for use and can be employed immediately. Without an accurate diagnosis they are a hit or miss method of treatment.

Autogenous vaccines at first sight appear to be the methods of choice, but time is required before they are available. However, they are not free from pit-falls. The fact that we collect material from the animal in question is not a guarantee that the vaccine prepared from it will contain the necessary antigens.

When mastitis has been running badly in a herd, I have had vaccines made from the affected animals and attempts have been made to immunise those not obviously affected. In some cases cessation of trouble coincided with the use of the vaccine. The owners were pleased with the results. I remain sceptical as to the virtue of the vaccines. The use on a limited scale of catarrhal vaccines for dogs and cats, using controls as far as one could, has not convinced me of their value. The use of suipestifer vaccine with a view to the cutting down of the incidence of necrotic enteritis, and where half of each litter were inoculated, showed no better results in vaccinated than unvaccinated pigs.

I should like to hear something about the use of autogenous vaccines for the treatment of metritis in mares. Persuaded by others who claimed success from their use, I have tried it on one case only. The first vaccine made for this mare from material collected from the uterus, contained a menagerie of organisms. A second vaccine made some weeks later contained *B. coli* only. The mare recovered, and that is all one can say. The use of stock and autogenous vaccines for interdigital cysts in dogs has left me unconvinced as to their value.

In medical literature reports dealing with numerous vaccines prepared in many different ways are very conflicting. It is very difficult for practising veterinary surgeons to form accurate opinions as to their efficacy. The

difficulties in some cases in connection with diagnosis, the want of adequate controls; the question of dosage; the effect, if any, of negative phases following the injections, and the alarming fact, emphasised once again in the paper, that we may be using preparations which have no immunising properties whatever, leave us in "Queer Street." What suggestions has Dr. Gordon to make in this matter? Would it be possible for laboratories to issue some concise form of questionnaire with the preparations—these to be answered by the practitioners for averaging at the laboratories.

The public has become so accustomed to the sight of hypodermic syringes, that we are for ever being asked, in connection with a given case, "Is there an injection?" I think the answer is that there are too many which we know very little or nothing about, and that stunting with vaccines may bring disrepute on what is sometimes a sound line of treatment.

Mr. R. Glover (Cambridge) said he wished to add his quota of thanks to Dr. Gordon for his excellent paper. There were only two points in connection with vaccine therapy which he desired to mention.

The first was with regard to B C G vaccine. The investigations which had so far been completed at Cambridge had satisfied them that B C G was innocuous for cattle and that when applied in the manner which they had stated, it seemed to be capable of inducing a reasonable degree of immunity.

He did not propose to enter into any details, since the subject was fully discussed at the Congress at Scarborough in 1936, but would reiterate what he had said on that occasion, *viz.*, that the investigations had reached a stage where controlled experiments in the field were regarded as necessary in order to test the efficacy of the vaccine under ordinary farming conditions. Last year he had put forward the suggestion that for the reduction of tuberculosis, under certain circumstances, B C G might provide a useful alternative scheme to the methods which depended upon tuberculin testing and removal of reactors. The proposed plans of the Ministry of Agriculture, as he understood them, provided for a preliminary survey to ascertain the extent of the disease in different parts of the country, followed by a selection of areas in which the incidence of the disease was low. In these districts a voluntary scheme would first be introduced, followed by compulsory eradication at a later stage, when sufficient progress had been made to justify such measures. If, however, one took into consideration the experience of the U.S.A. in the establishment of accredited areas, it would appear that very many years must elapse before this preliminary objective could be even partially attained. In the meantime the badly infected areas would remain almost untouched. If there was agreement that B C G had a definite immunising value, why not employ it in these districts in order to reduce the incidence of the disease so that attestation could be more easily applied when the proper time arrived?

If this were done he suggested that vaccinated calves should be indelibly marked in a distinctive manner, records kept of their history and that herds entirely composed of vaccinated animals should receive the same privileges as those which were attested. He felt sure that, in this manner, the progress in the eradication of the disease could be enormously accelerated.

The second point was in connection with preventive inoculation against contagious pustular dermatitis or malignant aphtha of the sheep. This was a subject in which he had been greatly interested for many years. It might be suggested that in many districts this disease was not of great importance and that measures of control by vaccination were unnecessary. Up to a point this might be true: nevertheless there were certain localities in which the malady caused, at times, quite considerable losses either through the actual death of animals or through loss in condition of fat lambs.

It was now known that all forms of the disease were caused primarily by a filterable virus, but various secondary invaders were responsible for the differences in severity and localisation of the lesions. The immunity induced by a natural attack was very solid and probably lasted at least two years.

As a result of their experimental work they had succeeded in producing an attenuated laboratory strain of the virus which, when applied to lambs, induced a mild eruption. Thanks to the active co-operation of numerous investigation officers and practitioners it had been possible to test the value of the vaccine in the field with encouraging results. It was not suggested, however, that following vaccination an absolute immunity against the disease always developed: in point of fact in some flocks a proportion of the vaccinated lambs did show small lesions when exposed to infection. It was significant, however, that in these instances the lesions were extremely mild as compared with those seen in control unvaccinated sheep and the owners were convinced that vaccination entirely prevented the falling off in condition which occurred in untreated fat lambs. From this point of view the use of vaccine could be regarded as highly successful.

He believed that Dr. Gordon had had some experience of this disease and he would like to ask him whether he was of the opinion that the use of a living, but attenuated, strain was justifiable in flocks in which the disease broke out with seasonal regularity.

Lieut.-Colonel H. A. Reid (New Zealand) said that in New Zealand they were deeply interested in that important subject of vaccine therapy and the application of vaccine in the prevention and cure of disease. He thought he might claim to have been something of a pioneer in vaccine therapy in regard to the veterinary profession. As far back as 1910 when Sir Almroth Wright published his epoch-making discoveries, he started to study and apply Sir Almroth's methods in regard to the prevention and cure of bovine mastitis in New Zealand, utilising mainly goats for experimental purposes on grounds of economy. He also employed vaccine therapy in various other suppurative conditions, controlling the dosage and the number of injections by methods corresponding with those described by Wright, with spectacular results of recovery in some cases but far more frequently with failure. It was in regard to mastitis that he would like to offer a few remarks, for among proprietary remedies there were few more widely used and widely exploited than vaccine therapy in relation to that disease. His own results following the application of vaccine therapy for mastitis were distinctly disappointing. He had long ago given it up as quite valueless in regard to either prevention or cure of mastitis.

With regard to the control of biological products, Lieut.-Colonel Reid said in New Zealand they had established, under an Act of Parliament, a Stock Remedies Board, and all proprietary animal remedies vended in New Zealand were required under the Stock Remedies Act to be registered subject to the approval of the Board. All formulae and claims respecting the properties of any particular remedy had to be presented to the Board which consisted of three veterinary surgeons and one pharmacist, and no exaggerated statements were allowed to appear on labels or advertisements. That measure was, of course, for the protection of the public against exploitation by vendors of nostrums and worthless remedies and sometimes, possibly, dangerous remedies. When they came to study the question of registering mastitis vaccines which were sold wholesale in New Zealand, the position was rather difficult because although the New Zealand Department of Agriculture did not support and could not recommend the use of vaccines in the treatment or prevention of mastitis, that opinion was not universally shared; in fact, in the State of New South Wales, Australia, the prophylactic use of mastitis vaccine had received some official recognition. Therefore, in New Zealand, they thought it only just to allow those vaccines still to be vended provided they conformed to certain standards in regard to their contents, all of which had to be disclosed on the formulae presented by the makers of the vaccines.

He had a few weeks ago attended a meeting of the Committee of the International Office of Epizootics in Paris where the question of abortion had been raised and the usual diversity of opinion regarding the employment of prophylactic vaccine had been expressed. He contended that the question of the value of those products should be settled by the veterinary profession as a whole throughout the world. They ought to know where they stood with reference to the application of certain vaccines. There was no question, of course, of the undoubted value of vaccines in connection with certain diseases, but their utility in a large number of conditions where they were widely employed was questionable.

Dr. R. F. Montgomerie (Beckenham) complimented Dr. Gordon particularly on the actual opening sentence which he chose for his paper. Usually one approached a paper like Dr. Gordon's and expected to find the "meat" somewhere in the summary at the end. But Dr. Gordon had chosen a very important sentence with which to open his paper. Dr. Gordon mentioned the wonderful part which experimentation on animals had played in the control of animal diseases. He would like to draw attention to and underline that point: many of them had had to meet the views of certain people who opposed any work of that kind. Some said that animals were tortured for the sake of human beings and that it was all wrong. It was time the general public realised how much experimentation on animals had meant to the animal community itself. He congratulated Dr. Gordon on drawing attention to that fact in the opening of his paper.

Proceeding, Dr. Montgomerie said he was rather surprised to see the first cross-heading in the paper "Vaccine Therapy *versus* Other Methods of Control of Infective Disease." As he read through the paper he realised his original condemnation was not justified, for he had then thought that Dr. Gordon was going on to suggest that there were opposing methods of control of disease. It seemed to him that the heading might well have been "Vaccine Therapy *hand-in-hand with* Other Methods of Control." He felt that far too often there was a tendency to get a syringe full of serum or vaccine, stick it in and to forget that there were other means of aiding the serum or vaccine to perform the function for which it was intended. They must keep that in mind for the use of vaccines or serum was simply one of the means of controlling disease, and when they stuck the vaccine into the animal through the syringe, they had not done all they could do in controlling that disease.

He was tremendously struck with one of those very happy phrases which Mr. Motton was so good at serving up to them. He talked about "stunting with vaccines." He could not use a better phrase in emphasising that there was far too much of that awful habit of "stunting with vaccines." Another point emphasised was the need for differentiation between sera and vaccines. It was not inappropriate that they should again get a clear picture in their minds as to the difference between sera and vaccines and the circumstances under which one, as opposed to the other, could best be used. Another point was the question of the exploitation of vaccine therapy. He supposed one thought at once of the manufacturer and blamed him for the exploitation. But they must bear in mind that he could not exploit the vaccine unless a great many people used it. They must couple themselves with the manufacturer if there was any exploitation. If they were to sit down quietly and make out a list of vaccine and serum products of real value they would find the list surprisingly short. Whereas if they took up a manufacturer's catalogue it would be exceedingly long. Professional use of these unproved, even useless, products permitted this exploitation. As to standardisation, he knew the need for it and he hoped something quite definite could be done on that point as a result of that meeting.

His last point, said Dr. Montgomerie, had reference to the interesting suggestion of Mr. Motton that some sort of questionnaire should go out on biological products in the hope that some information might come back to the preparer of those products. He believed the manufacturer of genuine biological products would be delighted to co-operate in such an effort and would be just as pleased in the end to get an adverse report as one which was highly favourable, *provided* there was always opportunity thoroughly to investigate the adverse report. They learned far more by the investigation of something which went in the opposite way to that expected than by sitting back in their chairs and saying, "How clever we have been; everything has gone well." Particularly in connection with one of the products used just now, they had all got to feel very thankful to Professor Dalling for a particular service. His investigation of breakdowns following distemper immunisation had brought the products and methods to their present-day efficiency. This work was a good example of what could be done. It would be an excellent thing if manufacturers of biological products would seek and invite criticism of their products, but they must have immediate opportunity to investigate breakdowns and failures. Then they would learn something. (Hear, hear.)

Professor T. Dalling (Cambridge) said that as one interested for some years in biological products he would like to say how much he appreciated the paper Dr. Gordon had written. Dr. Gordon had been associated with him some

years ago and he knew when they invited Dr. Gordon to write on this subject he would give them some of his own experiences. He agreed most heartily with much that had been said at the meeting by the other speakers. Biological products, in his opinion, had a definite place in the control of some of the important diseases of animals. It was very important, however, that biological products to be used in the prevention or treatment of any condition, should be subjected to some form of test which would show clearly whether they were of value. Unfortunately, to-day, there was too much material offered to the veterinary surgeon which had either not been tested at all or concerning which the tests were quite inadequate. In such cases it was purely chance whether the products were of any value. He said with all seriousness, however, that where a biological product had been tested by a reliable method and had been shown to conform to such tests, it became a very valuable adjunct in the prevention and control of animal disease. If the cause of a disease had been ascertained to be due to the action of bacteria or virus and it was possible to produce the disease artificially in susceptible animals, then it was a simple matter to test the efficacy of biological products prepared for the control of that disease. There were also equally reliable tests in which laboratory animals were used for testing purposes and in others satisfactory results were obtained by using *in vitro* methods of testing.

It was necessary to adopt certain standards in the testing of biological products and it was to be hoped that, in the near future, the authorities would introduce measures to ensure that the various materials used in connection with diseases of animals conformed to agreed standards and that only such products were available for the use of the veterinary profession. Much could be done in this direction and we could not do better than study what was done in connection with materials issued for use in connection with diseases of the human being. Provision was made under the Diseases of Animals Act, 1935, for the testing of biological products and it was hoped that those in authority would see fit to bring the necessary machinery into operation in the very near future. Some of the testing would have to be very carefully considered for it was not always easy to devise reliable methods. He felt sure, however, that when regulations were being considered, the advice of those who had been intimately concerned with such work would be sought and he knew it would be freely given.

In regard to distemper in dogs, Professor Dalling pointed out that the use of distemper vaccine followed by living virus, when properly applied and when tested products were used, gave rise to a high degree of immunity. That was the original Laidlaw-Dunkin method. A second method was devised later—the method Mr. Motton referred to, *viz.*, the injection of virus followed by serum or the so-called virus-serum method. Originally in this method the serum was injected first and immediately afterwards the dose of virus was given, but practitioners had found that the injection of virus followed after an interval by the dose of serum gave good results and this modification was now largely used. In the early days of immunisation against distemper the virus in use was in a liquid form. It had been found necessary to prepare virus in a dry form because of its rapid deterioration if issued as a liquid. In all probability, the explanation of the better results from the virus-serum modification of the serum-virus simultaneous method was consequent upon this change in the state of the injected virus. It might be that the virus in its dry state required some little time to produce the necessary stimulation of antibody before its action was prevented by the effects of the serum injected. The question of how long an interval to leave between the two injections appeared to be largely a matter of opinion. Experiments had shown that an interval of one hour was followed by good results but longer intervals were left by some practitioners with apparently similar results. It was felt, however, that an hour was a safe period. The results of immunising against distemper were, on the whole, excellent. Breakdowns, however, did occur, though they were definitely rare. All the reputed breakdowns were certainly not breakdowns in the true sense of the word for it had been clearly shown that diseases other than that caused by the virus of true distemper bore a close clinical resemblance to each other and were often confused with one another. It was only when virus could be recovered from an affected dog that one was justified in saying that the animal was affected with true distemper. Sometimes a prolonged search was necessary to establish the presence of virus but workers were assisted in their search for evidence of infection with virus from the results of the complement fixation test. The question was raised concerning the infectivity of dogs undergoing immunisation. Provided all went well and the dog showed no reaction, in all probability there was no risk of infection occurring. Should, however, a reaction occur, *e.g.*, temperature, diarrhoea, discharge from the nose, etc., there was every chance of virus being excreted. It was for this reason that it was recommended that dogs undergoing immunisation should be isolated.

Dr. Gordon had mentioned immunisation of horses against tetanus by the use of alum toxoid. Professor Dalling thought this was one of the best examples of effective immunisation in animals. It was a simple matter to show whether a horse had been successfully immunised by testing its serum for the presence of tetanus antitoxin. It was found that one dose of high value tetanus alum toxoid would give rise to the production of demonstrable antitoxin and that a second dose would increase the amount considerably.

Mr. F. H. Manley (Staffs.) said that Dr. Gordon had stated in his paper that the present evidence suggested that outstanding advances of the future would come more from the immunologist than from the hygienist and sanitarian. That statement appeared to have been accepted without reserve by other speakers at that meeting and perhaps that was understandable when they considered that most of the people present were immunologists. He thought a very good case could be made out for the eradication of certain diseases by other than immunological methods. Chronic diseases such as tuberculosis and abortion particularly were more amenable to other methods than to immunological methods. Further on Dr. Gordon said: "While these methods have much to commend them, especially that for bovine tuberculosis, there is likely to be further controversy before we arrive at an evaluation of their true merits." He felt that these methods had proved successful in other countries in reducing very considerably the incidence of bovine tuberculosis and abortion. It was not the methods that were at fault but the circumstances under which those methods might have to be

employed in this country, where the incidence of tuberculosis was very high, and in that respect, as Dr. Glover had said, it might be necessary to collaborate both methods before they could make much progress.

Mr. Motton had mentioned the question of danger from anthrax vaccine. In his opinion there was no danger from anthrax vaccine provided the strains used had been properly attenuated. In Cyprus they found where they used Pasteur's vaccine they had repeated breakdowns, but after they introduced vaccine prepared by the South African method those breakdowns were practically negligible. Twelve years ago, before carrying out vaccination in Cyprus, the losses were estimated at £20,000 a year. Last year the losses were estimated at about £600. That was an example of good results in those cases. (Hear, hear.)

Dr. Tom Hare (London) said he would have preferred to hear more clinicians taking part in that discussion. He would like to reinforce the most valuable point made by Dr. Montgomerie that vaccine therapy was a part and not the whole of their therapeusis for the preventive and curative treatment of disease. In regard to bovine mastitis he, with some practitioner colleagues in Scotland and this country, was working on a scheme involving the three-monthly bacteriological examination of a sample of milk from each of the four quarters of each cow in the herd. From the infected cases, which were isolated, an autogenous vaccine was made for curative or preventive inoculation of the herd. That inoculation was carried out once every three months with the segregation of the infected part of the herd from the non-infected. By keeping detailed records of each animal in those herds they had some interesting findings. For instance, not infrequently they found streptococcal mastitis and *B. pyogenes* mastitis running concurrently through the same herd. It was very necessary in dealing adequately with mastitis to know exactly what infection or infections were in the herd. That was a policy which might only be carried out where the owner was in a position to afford it; but it was a policy which was giving very good results.

In regard to swine infections the segregation of all new purchases for four weeks was a necessary procedure. The time of application of the vaccine was vitally important; for instance, they must vaccinate and immunise the weaners as early as possible in life, since owners could not afford to feed weaners which were later to go down with disease. Some deprecatory remarks had been made about the curative application of vaccine therapy but he was satisfied that the *proper* application of autogenous vaccine in an ever-increasing number of infective diseases was proving of considerable value to the clinician, whose experience was too often neglected in such discussions as this.

Some years ago vaccine therapy had gone into disfavour because some of the fundamental principles as laid down by Sir Almroth Wright had been ignored. Furthermore, vaccines should be made from our own organisms, and their administration and control should be performed only by members of the Royal College of Veterinary Surgeons. Vaccines should not be distributed direct to farmers by chemical firms nor imported from the Continent; they should be produced in this country by our own colleagues in our own veterinary laboratories. (Hear, hear.)

Mr. W. R. Kerr (Belfast) said he wished to associate himself with what he thought was the major feature of the paper, the urgent need for the standardisation of veterinary vaccines and sera. Dr. Gordon had quoted many examples of vaccines and sera and referred to their sterility, potency and purity. It was essential that the general practitioner should be safeguarded. He had sufficient trouble now with unreliable vaccines and sera. The *bona fide* laboratory worker also needed to be safeguarded. There was a further aspect which, if not part and parcel of the standardisation question, was closely associated with it. They knew in the past with how great a facility the farmer could obtain a hypodermic syringe and tuberculin. He could now obtain from certain firms, retail chemists and Continental sources, swine erysipelas vaccine and sera and that was another reason why these sources should be controlled in some way. He would like to bring the discussion to a crux in regard to the standardisation of vaccines and sera by placing before the Section the following resolution:—

> "Whereas is has been clearly shown that some biological products at present offered for use in the control of animal diseases are devoid of certain essential elements, this meeting is of opinion that the Association should urge the further extension and operation of Part II of the Diseases of Animals Act, 1935."

The President (Mr. C. V. Watkins) congratulated Dr. Gordon on his excellent paper. He had himself been accused of having a "Staphylococcal complex" and for this reason was very pleased to read Dr. Gordon's reference to Dr. Minett's enquiry into the use of staphylococcal toxoid for the treatment of chronic staphylococcal infections. He was interested because of a small experiment he had carried out with Dr. Minett upon a flock of ewes in which staphylococcal mastitis had been prevalent. Unfortunately, as so often happened in these experiments, the incidence of disease in the flock which was used proved to be extremely light, only one case developing in the control half of the flock, from which it was impossible to assess the value of the toxoid for the treated group. Blood samples were taken from all the ewes before and after injecting three doses of the toxoid and one interesting fact emerged. That was that the antitoxin content of the blood was materially increased as a result of the three injections, with an average increase of about eight times and in some cases up to twelve times that of the original content.

The Reply

Dr. Gordon, in replying to the debate, said he was grateful to Mr. Motton for the very admirable way in which he had led the discussion and to all the other speakers who had made such valuable contributions and answered many of the direct questions raised. Mr. Motton had said he (the speaker) had been very silent about vaccination against tuberculosis and contagious abortion. Mr. Glover had indicated that the work on B C G vaccination gave some hope that a product capable of immunising animals against tuberculosis might yet be evolved. A great deal of work in the perfection of such a product would require to be accomplished, however, before anything suitable for use in the field emerged. Mr. Motton was not too sure that the use of vaccines was confined to the treatment of chronic diseases. He (the speaker) felt that a vaccine,

when used for therapeutic purposes, was mainly of value for the treatment of chronic disease because some time must elapse between vaccination and the maximum immunity response. In consequence, if a vaccine were used in the treatment of an acute disease the immunity response resulting from vaccination would probably be developed too late to alter the course of the infection and in very acute diseases the animal might be dead before any immunity response was produced.

In regard to the question of the danger of using the flesh of an animal shortly after vaccination with an attenuated anti-anthrax vaccine, there was difficulty in giving a direct answer. If there was a risk of a "breakdown" following such vaccination and the vaccinated animal developed anthrax, then the flesh would be dangerous. If the vaccine was properly standardised and was one known to produce no disease in a large number of test animals before it was issued, then the flesh from vaccinated animals should be safe for use. With regard to a statement being made by those who issue vaccines as to their safety for use and their effect on the food value of carcases, that was an important point and one which would probably be dealt with adequately if the standardisation of vaccines were under legislative control.

The questions raised in connection with dog distemper vaccination had already been dealt with by Professor Dalling in the course of his remarks. Mr. Glover had referred to vaccination against contagious pustular dermatitis and the difficulty of running controlled experiments because the vaccine was a living avirulent strain of the virus. They had been given an opportunity of using some of this vaccine kindly supplied by Mr. Glover but the results were not yet available. Like him, they had found difficulty in arranging controlled field experiments owing to the risk of vaccinated animals acting as a source of infection for non-vaccinated animals, and he thought the only method available to them consisted in using the vaccine in all the sheep on infected farms for a number of years in succession, and if on those farms cases of contagious pustular dermatitis had been markedly reduced then they would have further evidence that they were able to control this disease. Questions as to vaccination against bovine mastitis had been discussed by Lieut.-Colonel Reid and Dr. Hare. It was an enormous problem and one which involved the difficulty of a study of streptococcal and other antigens. Speaking of the establishment of herds free from mastitis by the bacteriological examination of milk followed by segregation of infected from clean cows, Dr. Gordon said there was much to commend the method. He had always been led to believe, however, that the streptococcus of mastitis was an obligatory parasite, but recent experience had not altogether supported that belief. It was interesting to hear from Lieut.-Colonel Reid's remarks that New Zealand with its Stock Remedies Board was giving the mother country a lead in methods for the control of the manufacture and issue of biological products. It seemed that, in this country, steps should have been taken long before now to control the manufacture of these products. He was glad Mr. Kerr's resolution had been so well received and hoped that in this country adequate control measures would now be taken. Mr. Manley had referred to remarks in the paper in which he (Dr. Gordon) suggested that segregation methods had not proved satisfactory. That was not the exact impression he had intended to convey. What he really meant was that when those methods were carried out under ideal conditions they were very useful, but in their practical application they were often open to the criticism of the epidemiologist and in this connection he would refer Mr. Manley to the Epidemiological Studies of Greenwood, Bradford Hill, Topley and Wilson. In regard to the subheading in the paper which had been objected to by one speaker, Dr. Gordon said that he agreed that vaccine therapy often was used hand in hand with other methods for the control of disease. There were, of course, examples such as braxy, lamb dysentery and so on, where vaccination was the only method employed. They had also heard in the course of the discussion that some people were combining vaccination and segregation methods for diseases like bovine abortion and mastitis. The increase in the use of vaccines and the lack of legislative control over their issue tempted him to make use of that quatrain from Omar Khayyám in which he wrote:—

> "Ah! Love! could thou and I with Fate conspire,
> To grasp this sorry scheme of things entire,
> Would we not shatter it to bits—and then
> Remould it nearer to the heart's desire!"

In conclusion, Dr. Gordon said that this sentiment appealed to the student of immunology watching the rapid increase in the number of biological products which possibly had little more than their gaudy label to commend them. He was glad, therefore, that his humble effort had further stimulated in their minds the need for legislative control over the standardisation of biological products.

The President (Mr. C. V. Watkins) said the resolution proposed by Mr. Kerr would go forward to the General Meeting of the National Veterinary Medical Association.

The twenty-fifth annual session of the Indian Science Congress Association will be held in Calcutta on January 3rd to 9th under the Presidency of the Right Hon. Lord Rutherford. To mark the silver jubilee of the Association, the meeting is to be a joint session with the British Association. About 100 men of science have been invited from Great Britain, while invitations have also been extended to a number of scientific workers in other countries. Sir Arthur Olver, F.R.C.V.S., will preside over the Veterinary Research Section.

* * * * *

The Ayrshire cow, Ardgowan Valda, has broken the world's record for butter fat production by producing on three milkings daily 31,158 lb. milk and 1,356 lb. fat in 365 days. This not only beats the previous record for an Ayrshire in both milk and butter fat, but also the previous world's record for butter fat of all breeds, on three milkings daily. This official yield was made under the Canadian Record of Performance Test. Born on August 26th, 1926, Ardgowan Valda was bred by Sir Hugh Shaw Stewart, Ardgowan, Inverkip, reaching Canada in May, 1931.

The Veterinary Record

September 11th, 1937.

The Veterinary Practitioner and the State Service

THE decision of the Government to use the services of the veterinary practitioner in the projected schemes for the control and eradication of diseases in cattle is one which will receive the support of the profession generally. Since the Cattle Diseases Committee in 1934 unwisely recommended measures whereby veterinary practitioners found no permanent place in the proposed State service for the eradication of disease grave uncertainty has grown within the profession as to the future of veterinary practice in agricultural districts. The special committee of the N.V.M.A., which recently reported upon "The Veterinary Profession and its Organisation for the Control of Animal Diseases," discussed the recommendations of the above Government committee at some length and clearly indicated the harmful results liable to follow the adoption of the latter committee's recommendations concerning veterinary practitioners. The Government, we are glad to say, has decided in favour of the views expressed by the N.V.M.A. and the practitioner is to be accorded his due place in the new centralised service.

At the Congress Banquet the Minister of Agriculture and Fisheries made the following statement: "Mine is no desire to magnify a State service at his (the general practitioner's) expense." It would seem to follow from this statement that the Government's decision is a permanent one, provided the service is carried out efficiently. Previously the Minister had assured the delegation from the N.V.M.A. that the Ministry would have to use a great number of part-time officers for the purpose of their survey, and as the future of the scheme developed, he thought the Association would find that more work would be available for the practising veterinary surgeon. He referred to the employment of the part-time officer and added that where that system had been found the best and most economical, the Ministry would continue to use it.

It seems to be clear that under their new policy the Government intend to give the veterinary practitioner every opportunity to work within the organisation. Only lack of efficiency can jeopardise the position of the practitioner within the scheme. Practitioners have asserted that they are competent to perform this work: they are now given the opportunity to substantiate their claim.

CLINICAL COMMUNICATION

Duodenal Displacement in an Airedale Puppy

CONNIE M. FORD, M.R.C.V.S.
New Eltham

Subject.—An Airedale bitch puppy, born October 2nd, 1936.

History.—The puppy was one of a litter purchased at the age of three weeks, the dam being loaned to the new owner until the puppies were weaned. At six weeks old the puppy began to vomit occasionally, and then more frequently until at eight weeks it was vomiting every meal a few minutes after ingestion. Almost at once the vomit was reingested and then retained. Stools were normal and the appetite good. The rest of the litter were normal.

Examination.—The puppy was brought for examination on November 28th, 1936. It was very bright but rather thin and pot-bellied. The temperature was normal and palpation of the abdomen revealed no abnormality.

Diagnosis.—The insidious nature of the disease seemed to rule out any acute trouble such as a foreign body or intussusception, while the good health of the rest of the litter eliminated dietetic errors and infectious disease. A tentative diagnosis of pyloric stricture was made but no satisfactory conclusion drawn.

Treatment.—This was purely palliative, an emulsion of kaolin in liquid paraffin being given in small repeated doses, and semi-liquid diet in small quantities at frequent intervals recommended. The vomiting gradually stopped and solid food was introduced in small, frequent feeds.

Course.—The puppy, although very lively and voracious, never gained weight normally and was liable to vomit if given too much food at one time.

The owner, a breeder and dealer, privately dosed her for worms, with no effect.

On July 6th, 1937, when she was nine months old, she was again examined. She was now markedly emaciated, although eating three meals a day with relish. Apart from the emaciation no abnormality was discovered. In view of the long-standing nature of the condition and the obvious unsaleability of the puppy, destruction was advised, and carried out by means of

nembutal and hydrocyanic acid given intrathoracically.

Post-mortem Examination.—On opening the abdomen there were first encountered the duodenum, which looked normal, and a grossly enlarged and congested pancreas, pink in colour. These lay diagonally across the caecum, which was congested and enlarged to about twice the size of the normal stomach in the dog. The caecum was full of semi-solid ingesta, and appeared to be constricted where the duodenum crossed it. Its convolutions were firmly adherent to omentum and to each other.

Dorsal to this were the rest of the intestines, which appeared normal. The stomach was in its usual position and also seemed normal.

Another dead dog was opened, and it was found possible to reproduce the displacement observed simply by withdrawing the duodenum along the right wall of the abdomen, and laying it across the ventral surface of the intestines.

Discussion

The case presents three questions:—

Was the condition congenital and only productive of symptoms when the puppy began to take solid food, or was it due to some accident a few weeks after birth?

Could it have been diagnosed in life by X-ray following a barium meal, supposing the animal had been economically worth it?

Had it been diagnosed, could the duodenum have been permanently replaced by surgical means?

Livestock Commission's Approval Necessary for New Livestock Markets

Under Section 14 of the Livestock Industry Act, 1937, no premises in Great Britain other than premises at which a market in respect of livestock (cattle, sheep or pigs) was lawfully held at some time during the year which ended on November 30th, 1936, may, on or after November 1st, 1937, be used for holding a market in respect of livestock, unless the premises are approved for the purpose by an Order of the Livestock Commission, and any person contravening this provision is liable on summary conviction to a fine not exceeding £100.

The Act requires the Commission, before approving any premises, to consult the Livestock Advisory Committee and such local authorities and other bodies as appear to be interested in the matter.

Exceptions to the foregoing restrictions are made by the Act in respect of the use of a farm for the purpose of effecting at the farm any sale, by or on behalf of the occupier thereof, of livestock which, at the time of the sale, is being kept by the occupier; or any sale of livestock being a sale incidental to the sale of the farm or to the termination of the tenancy thereof; or for the purpose of effecting at the farm sales of livestock on any occasion in respect of which special authority has been granted by the Livestock Commission.

ABSTRACTS

[Studies in the Duration of Immunity of Horses against Tetanus following Active Immunization with Alum Tetanus Toxoid. Rawlings, W. B., and Hottle, G. A. (1936.) *N. Amer. Vet.* **17.** 5. 30-32.]

Rawlings has previously reported that one month after horses had received a second injection of alum tetanus toxoid (tetanus toxoid containing aluminium potassium sulphate) trial bleedings showed that their sera contained from two to eight units of antitoxin per c.c. The object of the present report is to state the length of time tetanus antitoxin can be demonstrated in the serum in amount sufficient to protect against natural infection.

A group of eleven horses were given two doses of alum tetanus toxoid at an interval of one to three months. Twelve to 14 months after first injections all except one animal showed 0·01 to over 0·02 unit of antitoxin per cubic centimetre of serum. A second group of twelve horses treated in the above manner were tested 18 to 21 months later. Serum tests showed from 0·001 to more than 0·02 unit of antitoxin per c.c. (Ramon considers that a serum content of 0·001 unit is sufficient to protect against natural infection.)

From the study conducted the authors consider that two doses of alum tetanus toxoid confer immunity to tetanus for a period exceeding 21 months.

W. L. S.

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[Cardiac Murmurs in the Horse produced by the Oto-Cardiac Reflex. Papadaniel, S. J., and Mattaiaki, E. (1936.) *An. Med. vét.* **81.** 2. 49-55.]

In man reflex slowing of the pulse can usually be demonstrated by pressure upon the eyeball at the outer canthus—oculo-cardiac reflex. Though unable to reproduce this in the horse, the authors of this paper claim to have demonstrated an "oto-cardiac reflex," whereby application of a twitch to the right ear caused slowing of the heart in some subjects and acceleration in others. These effects they associate with vagotonicity and sympathetonicity, respectively, in the subjects concerned and on the basis of this theory they have been utilising the reflex during the last few years to gain an indication of the state of "tonus" of the autonomic nervous system of the horse in health and disease.

In some cases they found that the reflex gave rise to systolic cardiac murmurs, most noticeable at the base of the heart. Acceleration of

the heart by exercise or by the administration of atropine failed to reproduce the murmurs as also did the application of the twitch to the left ear or the upper lip. Five cases are quoted and discussed. The authors consider the sounds to be associated with some slight cardiac lesion not demonstrable by ordinary clinical methods but accentuated by the action of the oto-cardiac reflex.

A. R.

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[Production of so-called Alkali Disease in Hogs by Feeding Corn Grown in Affected Area. Schoening, H. W. (1936.) *N. Amer. Vet.* **17.** 9. 22-28.]

"Alkali disease" was produced in two pigs by feeding corn grown in an area where the disease is endemic. A control animal fed on corn from an area where the disease is unknown did not contract the disease. Symptoms were a loss of hair and dryness of the skin of the back and flanks. Respiration was laboured and lesions occurred on the feet. The lesions consisted of a new growth of horn which almost replaced the old horn, and was sharply demarcated from it. *Post-mortem* examination of these animals revealed no gross changes. Changes in the kidney suggested a mild form of irritation. Chemical analysis of the corn indicated that selenium was responsible for this condition in pigs.

E. C. H.

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[Generalised Myofibromatosis in a New-born Calf. (Trans. title.) Anreiter, J. (1936.) *Wien. tierärztl. Monatsschr.* **23.** 761-764.]

A very unusual generalised congenital myofibromatosis in a new-born calf is described. The calf was still-born, and well developed. A large, hard swelling was situated on the right side of the head, extending from below the eye to behind the ear.

Numerous tumour-like swellings were situated on the placenta; these varied in size, were of a greyish-white appearance, and were homogeneous in section. The chorion was thickened and oedematous. The spleen was increased in size, being larger than the liver, and many tumour-like masses were found throughout the tissue. Secondary metastases were found also in the liver and lung tissue, and in the mediastinal glands. The kidneys showed similar changes to those found in the spleen and lungs.

Rectal and vaginal examination of the cow revealed no metastatic changes which might account for the condition and she subsequently gave birth to a normal calf.

E. C. H.

[The Adequacy of Commercial Pasteurization for the Destruction of Tubercle Bacilli. Humphriss, E., Penden, D., and Wright, H. D. (1937.) *Lancet.* **233.**]

Milk samples from about 15 pasteurizing depôts in Liverpool were examined frequently during a two-year period. In all cases the heat-treatment consisted of heating at 145 to 150° F. for 30 minutes. All the depôts were subject to frequent municipal inspection.

Out of 440 samples taken after pasteurization examined by biological test none was found to contain tubercle bacilli, whereas out of 2,402 raw milk samples collected by city inspectors during the same period 233 contained this organism.

Samples from one well-designed, well-run plant were examined twice weekly for a year, corresponding raw and pasteurized samples being collected. Out of 102 raw samples 61 were contaminated whilst in no case were tubercle bacilli found after pasteurization.

As was anticipated, there was generally a greater incidence of contamination the bigger the volumes of milk sampled, but figures in this connection were confused by the fact that varying bulks of milk arrived daily from two separate sources and that the quality of the milk from the two sources differed in regard to tubercle contamination. It was shown by direct experiment that the high incidence of tubercle contamination of raw samples was real and not due to living tubercle bacilli persisting in the inlet pipes of the pasteurizing plant. This result was anticipated, since the whole plant was steam sterilised between each run.

E. J. P.

The Pit Ponies Protection Society has drafted a Bill for submission to Parliament, which provides single eight-hour day shifts for each pit pony, and raises the minimum age of pony drivers to 16, with proper training in the care of the animals, and for the removal of every seriously injured or sick pony to the surface for treatment. The proposed legislation also provides that all animals should be examined at least three times a year by a veterinary surgeon responsible only to the Government.

* * * * *

Hundreds of inquiries have been received by the Ministry of Agriculture under the new scheme for granting financial assistance to farmers towards the cost of freeing their herds from tuberculosis. The scheme came into operation on June 1st, and the number is expected to increase rapidly with the inspection of other herds. There are now 365 herds in England and Wales registered by the Ministry as free from tuberculosis.

REVIEW

["Grass Drying." By E. J. Roberts. Agricultural Research Monograph, 1937. H.M. Stationery Office. 2s. nett.]

In September, 1936, there was published the first report of the Committee on Grass Drying set up by the Agricultural Research Council. This received notice in our columns. The present report, running to 124 pages, covers a much wider field and adds a great deal of new information. It can be regarded as a useful and up-to-date account of the present position of artificial grass drying in this country.

It would be easy in this review to give something of the nature of an expanded summary of contents and leave readers to purchase the monograph if they so desired. It is felt, however, that owing to the increasing popularity of the idea of grass drying (there were some 50 driers in operation in 1936 as against 12 in 1935, and the number will doubtless be far greater in 1937), readers may desire to have a rather more critical survey of the subject presented to them.

It was suggested in these columns earlier, that the science of grass drying was destined to loom largely in public and farming interest, and that probably, as with other somewhat revolutionary innovations, it might be that undue early popularity would be followed by a sense of disappointment if the somewhat exaggerated initial claims were unfulfilled.

The present report gives some hints which show that these views were not unfounded. One of the important observatjons made early in the report is that it is uneconomic to cut and dry grass when its crude protein content is below 17 per cent. of the total dry matter. A second point to note is the great variability of the costs of drying from farm to farm. On some the figure is given as £4 8s. per ton; on others up to £7 per ton, with an average of about £6. These costs vary with the type of drier used and the particular type of agriculture in vogue in each district, as well as with other factors. They compare favourably with the prices of concentrated feeding-stuffs ruling at the present time, provided the nutritive value of the product possesses those qualities in feeding practice which have been claimed for it experimentally. On general grounds a further interesting point is made. The majority of the farms (about 87 per cent.) where driers have been installed are owned or farmed by men of the "gentleman-farmer" type. This is undoubtedly partly due to the greater command of capital possessed by these men, but we feel that the average tenant-farmer, who has to make his farming pay, and whose experience is greater, is wise in exercising due caution before he commits himself to a course which is costly and about which a great deal of information must still be obtained. Since the issue of this report one of the most courageous and progressive farmers in England, who at one time was enthusiastic in his support of grass drying, has announced his disappointment with the results obtained and has practically abandoned it.

The report contains an excellent account of the methods for producing suitable herbage crops for drying, in so far as present knowledge is available. The commanding importance of the weather is stressed again and again, the optimum conditions being those which will provide a sufficient rainfall to give a rapid growth of not-too-succulent grass. In a wet year there may be an unduly high moisture content which increases cost of evaporation, while in a very dry summer the yield of dried grass per acre may be little more than half what it is in a favourable season. Methods of manuring, botanical composition, frequency of cutting, seasonal fluctuations, and other points are fully considered. The yields obtained for 1936 are summarised. We note here again great differences. On the best farms, yields of baled dried grass per acre were as high as 4·0 tons; the two lowest yields are given as 1·1 tons and 1·55 tons, both from orchards. The average yield for all types of farms would seem to lie between 2·5 and 3·0 tons per acre. It may be noted that the dried lucerne yield per acre for the Norfolk lucerne farms (where during recent years a great industry has been initiated) is from 1·56 for 1934 to 2·0 tons for 1935 and 1936.

The water-content of the herbage on entering the drier plays a very important part in the cost of running the drier. This aspect is fully considered. With a 90 per cent. water-content (which may be taken as the maximum water-content of young, wet, growing grass) it takes 9 tons of fresh cut grass to give 1 ton of dried product; while with a 50 per cent. moisture content where grass has been well wilted after cutting, only 2 tons of fresh grass are needed to give 1 ton of dried grass. The effect of undue wilting is to lower the nutritive value of the product and to reduce the carotene content, however, so that a balance of moisture must be obtained for the best and most economical results. We may omit here further consideration of this aspect, since it pertains particularly to the processing of the product.

Cutting and handling are described, as are furnaces, fuels and power, while some 30 pages, admirably illustrated, are devoted to a technical consideration of the actual grass driers themselves, those of British manufacture being considered first and various foreign makes being discussed later.

The section on the nutritive value of dried grass is perhaps of greatest importance to our

readers. It is interesting to note that the previous lack of agreement between different authorities regarding the variation in food values of dried grass produced in the "flush" period of spring growth and that from the same land produced in late summer or autumn, seems to be capable of explanation on the basis that differences in management, frequency of cutting, etc., may account for the majority of such variation. Cambridge results show that where the grass is cut at close intervals it can be accurately described as "dried *young* grass" throughout the whole growing season: the composition and the nutritive value remain approximately constant. On the other hand, if a longer period is allowed to elapse between cuttings a more mature product is obtained which can no longer be described as *young*. For this type of product the term "*super-hay*" is suggested. Super-hay has a better feeding value than even the best hay produced by ordinary methods, but it is inferior to dried young grass. During such a season as 1936, climatic conditions were so favourable for rapid growth of herbage that many grass drying installations could not cope with the quantities of grass which had reached the proper stage for cutting and drying. This material matured fast and when cut and dried later could only be properly classed as super-hay. In future, drying plants of greater capacity will probably be able to deal with sudden surplus quantities, or smaller acreages may be reserved for growing grass for drying.

The criteria for determining the nutritive value of dried grass seem to be based upon: (1) the *crude protein content*, which varies from as low as 7·3 per cent. in inferior samples to 25·9 per cent. in the best, with a general all-over average of about 13·5 to 14·0 per cent.; (2) *crude fibre content*, which average approximately 20 per cent. and when above 28 per cent. is regarded as inferior; and (3) the *carotene content*, which should be about 200 to 250 mgms. per kilo, though these amounts are often considerably exceeded.

The Grass Driers' Association suggested for 1936 the following table:—

Grade I	...	Crude protein content		17% or more
Grade II	...	,,	,,	14-17%
Grade III	...	,,	,,	12-14%
Super-hay	.	,,	,,	8-12%

Only Grade I can be regarded as a concentrate. It has a starch equivalent of about 60.

Quite a large amount of data is now available to show that when used with care and discretion, artificially dried grass can become a very valuable home-produced feeding-stuff for dairy cows and for sheep in particular. It is unnecessary to detail these here, but some particular characteristics may be noted. Carotene, the precursor of vitamin A, which gives to the milk of cows fed on green grass in summer its rich yellow colour, and which intensifies the orange yellow colour of the yolks of eggs, is liable to be deficient or absent in the concentrated foods used for ordinary stock feeding in winter. Good quality dried grass supplies adequate amounts of carotene during this deficiency period.

Many experiments have shown that it is satisfactory to use up to about 15 or 16 lb. of best quality dried grass for cows daily, given in three separate feeds. Workers at Jealott's Hill have constructed a table, from which the following are extracted:—

(1) Four lb. of dried grass possessing 18 per cent. or more crude protein, will give an S.E. or 2·44 lb. and a P.E. of 0·54 lb., and is equivalent in feeding to 3·5 lb. of dairy cake.

(2) Six lb. of dried grass possessing 15 per cent. crude protein, will give an S.E. of 3·48 lb. and a P.E. of 0·57 lb., and is equivalent to 3·5 lb. dairy cake + 3 lb. hay.

(3) Four lb. of dried grass with 12 per cent. crude protein will give an S.E. of 1·96 lb. and a P.E. of 0·26 lb., and is equivalent to 6 lb. of average meadow hay.

As a general guide, if the dried grass is of best quality it may form the sole concentrate fed, along with hay (and, if necessary, roots) for cows giving up to 3 gallons of milk daily; if of second quality it may, with the necessary hay, provide enough concentrate for 2-gallon cows; while if it is of third-rate quality only it can be used to substitute concentrates for the first gallon of milk.

Probably too much nutritive value has been assumed by many enthusiasts during recent times: we feel that the evidence available warrants us in advising that just as there is no single food adequate for all purposes, dried grass alone cannot be regarded as a sole food, but it is capable of playing a most important part in livestock nutrition when used in conjunction with other suitable foodstuffs, as constituent of a balanced mixture.

Some caution must be exercised in reading the short paragraph on the possible effect on disease incidence. The veterinary profession has heard similar claims made for foodstuffs and other substances so often that it will demand definite proof of greater freedom from such diseases as sterility, contagious abortion, mastitis, etc., reinforced by critical experimentation, before it can accept the claims made in this connection. It must be pointed out that the author of this monograph is himself cautious, and quite rightly points out that there is so far no definite positive evidence.

The monograph ends with a consideration of costs of dried grass making and contains a useful bibliography. The reader is referred

(*Concluded at foot of col.* 1, *p.* 1186.)

REPORTS

West Riding of Yorkshire

REPORT OF CHIEF VETERINARY OFFICER, YEAR 1936-37

To those who have followed with interest the annual reports of Major Rabagliati, Chief Veterinary Officer of the West Riding, it can be said that his report on the duties carried out during the year 1936-37 is a most interesting and instructive document and is one of great value as a record concerning the disease position in the county.

Although a large staff of professional and lay assistants are engaged in the Veterinary Department, the amount of work which this Department has carried out during the year is remarkable. For example, in dealing with sheep scab in collaboration with the Ministry of Agriculture officers, 137,843 sheep were submitted to a veterinary examination. During the year the number of outbreaks of scab have fallen to 15. When this position is compared with 22 outbreaks in 1935-36, 68 in 1934-35 and 88 in 1933-34, it is clear that some good work has been carried out in dealing with this disease.

It is pointed out that the policy has been adopted of placing individual or groups of farms under "Form G" where there appears to be a special danger of scab lurking about, *in lieu* of imposing general movement restrictions on an area. This policy has the advantage over a scheduled area in restricting movement only to those flocks where a special danger exists, and does not inconvenience sheep-owners in enclosed farms which may be adjacent. During the year 175 additional farms were placed under "Form G" but at the end of March it was found possible to remove these restrictions from 237 farms, leaving a total of 120 premises in the county still under restrictions.

In the section dealing with tuberculosis it is noted that 1,277 cattle were slaughtered under the Tuberculosis Order as compared with 1,192 in the previous year and 898 ten years ago. Of the 1,769 cattle reported as suspected of tuberculosis 1,040 were reported by owners, of which 542 were affected. Six hundred and eight were detected on routine inspection by the veterinary staff and 121 were reported by veterinary practitioners.

These tuberculous cattle were all found on 971 farms out of approximately 9,000 in the county. This shows that about one farm in ten had disease as defined by the Order. Of the cases dealt with, 441 were affected with udder tuberculosis or giving tuberculous milk—which from the public health standpoint is of great moment, showing as it does the great importance of the work in lessening the quantity of tuberculous milk on the market. The number of cattle reported by owners is noteworthy, indicating that the owners are also co-operating with the veterinary staff in the removal of diseased animals from their herds. Major Rabagliati lays great stress on the importance of having the owners present at *post-mortem* examinations if possible and is of opinion that the little extra trouble involved leads to a better understanding between the farmers and the staff. Legal proceedings were taken against four farmers for failing to report diseased cattle under the Order.

Four hundred and forty-five visits were made by the veterinary staff to markets and attention was given to the presence of diseased animals, overstocking of cows and cleansing of vehicles.

Considerable interest is taken in the laboratory side of their work by the veterinary staff, judging from the number of specimens examined, *viz.*, 3,493. Of these, 691 were found positive to tuberculosis and eleven to anthrax and it is rightly pointed out that considerable experience is necessary to make a wise decision with regard to milk and prevent too many unnecessary biological tests, while at the same time not neglecting to send those really suspicious but in which no infection could be found microscopically. This is one saving in expenditure which accrues from the clinician himself examining the samples microscopically in the first instance.

Under the Milk and Dairies Acts and Orders a large amount of work has been undertaken, the results of which are set out in the report and can easily be understood by either the lay or professional reader. A summary of this could not adequately indicate the extent of the service which has developed in the county during the past ten years.

The examination of mixed herd samples of milk for tuberculous infection both by the county and outside authorities revealed a total of 107 and 52 reports respectively of supplies infected. It is interesting to note that the county authority's laboratory found five samples of milk from tuberculin tested herds and five samples of pasteurized milk infected.

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direct to the monograph for further information on these aspects.

We feel that Mr. Roberts is to be heartily congratulated for the care and conscientiousness with which he has carried out his work. The publication forms a most valuable addition to modern knowledge and has the refreshing quality of being concerned primarily with fact rather than with fancy. A number of excellent photographs, graphs and drawings add greatly to its usefulness.

The growth of the milk-in-schools scheme can be gauged by the fact that at the commencement of this scheme in 1934, 54,550 bottles of one-third of a pint capacity were being supplied, whereas in the year 1936-37, 20,890,904 bottles of milk were supplied to the West Riding schools. It is also noted that 60 per cent. of this milk was pasteurized and regret is expressed that as tuberculin tested milk does not come under the control of the Milk Marketing Board it is not possible to provide this class of milk for school children to any appreciable extent.

The routine inspection carried out under the Milk and Dairies Order, 1926, amounted to 16,804 visits to farms and the clinical examination of 208,043 cattle. The percentage of cows found with tuberculosis of the udder during the year was 0·42 which has not varied much from this percentage year by year.

Under the Milk (Special Designations) Order, 1936, the number of tuberculin tested herds is 56 and accredited 434. It was decided that the tuberculin testing should be done by veterinary practitioners, the fees being paid by the producer direct to the veterinary surgeon concerned and it is pointed out that experience in testing licensed "flying" herds revealed an average of 36 per cent. of reactors in these herds. On the other hand, the position of those herds which are more or less self-contained may be regarded as satisfactory and Major Rabagliati makes certain suggestions regarding flying herds which he considers necessary for safeguarding against infection, particularly the need for frequent check testing at three-monthly intervals if such herds are to be licensed.

He also points out that the infected tuberculin tested milk samples found containing tuberculous infection were from flying herds, and none has proved to be infected since the county authority took over the control and supervision of the herds in January, 1937.

Disappointment is shown regarding the small number of attested herds in the county. Certain areas in the county are breeding areas and the elimination of the disease would be of considerable benefit to those areas as there would be an excellent market for their stock.

The conditions for accredited licences are reviewed and it is interesting to note that during the year an officer was transferred to the Veterinary Department to collect samples of milk for bacteriological examination; it is hoped to collect six samples per annum from each licensed producer. The veterinary staff also collaborate with the district sanitary inspectors in making joint inspections of farms.

During the year members of the staff have covered 148,469 miles in carrying out their duties. Valuable observations on the control of the scheduled and some of the non-scheduled diseases are also included. The disease position in the county is well under control but it is freely acknowledged that the incidence of tuberculosis is high and will remain so for many years until other areas are in a position to supply a larger number of tubercle-free cattle. In the case of other scheduled diseases the numbers of outbreaks are remarkably low considering the extent of the county and the number of animals kept.

* * * * *

Leicestershire County Council

REPORT OF THE COUNTY VETERINARY OFFICER FOR THE YEAR 1936

The above report commences with a brief introduction, which is followed by details relating to the organisation of the Veterinary Department. For administration purposes the county is divided into five districts, each of which is in the charge of a whole-time veterinary officer who carries out all the veterinary duties arising under the Diseases of Animals Acts and the Milk and Dairies Acts and Orders.

Under the Diseases of Animals Acts 58 suspected cases of anthrax were reported, four of which were confirmed. There were also seven outbreaks of sheep scab, involving 589 sheep, and 27 cases of swine fever.

During the year 581 animals were slaughtered under the Tuberculosis Order of 1925, and 426 of these were detected by the staff during routine inspections. On *post-mortem* examination 349 proved to be "not advanced," 228 were "advanced," and four had no visible lesions of tuberculosis. It was also found that in 198 cases the animals were affected with tuberculosis of the udder, 25 were suffering from tuberculous emaciation, and 354 from tuberculosis with chronic cough. The average amount of compensation paid to owners was £5 15s. 4d. per animal.

Under the Milk (Special Designations) Order of 1936, there were 13 producers of tuberculin tested milk in the county at the end of the year. The tuberculin testing of animals in these herds is carried out by private veterinary practitioners at the expense of the farmer, but the clinical examinations are performed by the county staff free of charge. There are 388 "accredited" producers in the county with approximately 10,142 cows, and during the year 1,257 visits were paid to these herds, as a result of which 103 animals were found to be suffering from tuberculosis, 595 from mastitis, and 31 from other scheduled diseases.

There were 2,531 non-graded herds in the county liable to routine inspection under the

Milk and Dairies Order of 1926, and during the year 5,959 visits were paid to these farms, in the course of which 74,634 animals were examined. When making these examinations 295 cases of tuberculosis, 1,662 mastitis and 35 other diseases were found by the staff.

In connection with the Milk and Dairies (Consolidation) Act of 1915, reports were received from other local authorities that 29 samples of milk produced within the county had been found to contain tubercle bacilli. In 21 cases tuberculous cows were detected on the premises concerned but in the remaining eight instances none of the animals showed evidence of tuberculosis, and control samples of milk proved negative after biological examination.

Each member of the veterinary staff is equipped with a microscope and other essentials to enable him to make microscopical examinations, and there is also a central laboratory adjoining the office of the Veterinary Department. During the year the staff carried out 2,438 microscopical examinations of various material with the following percentage of positive results: milk 5·6, sputa 36·4, blood 6·9, wool and skin scrapings 75·0.

Many interesting statistical tables are to be found in this report, particularly in relation to the administration of the Tuberculosis Order, and the County Veterinary Officer, Mr. G. Durrant, B.V.Sc., M.R.C.V.S., D.V.H., is to be congratulated upon this valuable record of the activities of his department during the year 1936.

Animal Population of Northern Ireland

The agricultural statistics for Northern Ireland show that among livestock the number of horses and pigs has increased, while there is a reduction in the numbers of cattle, sheep and poultry. The cattle population has fallen from 769,653 to 730,216—due, it is stated, to the remunerative prices realised by farmers for the sale of milk cows and fat cattle in recent months—and the number of sheep from 834,754 to 828,852. Pigs again show an increase, the number being 569,475 as compared with 521,654 a year ago. Since the Ulster Pigs Scheme came into existence the rate of growth of the pig population has been phenomenal, but it would now seem that that rate is slowing down, especially since the number of breeding sows has fallen from 56,509 to 54,331. The number of horses used in agriculture has fallen from 81,309 to 80,459; but the number of unbroken horses has increased from 9,527 to 10,483, which indicates a continued revival in horse breeding. Turkeys have increased from 389,273 to 420,297, but the numbers of geese and ducks have declined by 27,444 and 70,759, respectively; and the number of ordinary fowls has dropped from 9,542,730 to 9,219,565, the reduction being entirely in the number of birds hatched this year. The total poultry population remains, however, well above the ten million mark, which was reached four years ago.

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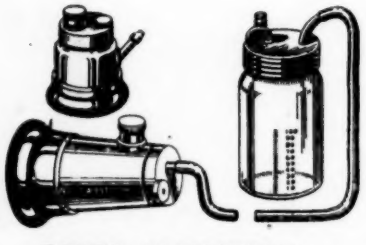

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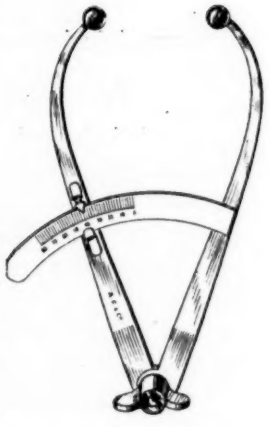

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I. D. MacRae, Esq., M.R.C.V.S., Glengarry, Lamlash, Arran, per Professor Mitchell	1	0	0
Wm. Nairn, Esq., M.R.C.V.S., Erichtbank, Blairgowrie	10	10	0
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James Spreull, Esq., F.R.C.V.S., 40, Caxton Street, East London, South Africa... ...	5	0	0
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Major W. S. Stevens, M.R.C.V.S., c/o Messrs. Glyn, Mills & Co., 22, Whitehall, London, S.W.1	1	1	0
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Dr. W. M. Scott, F.R.C.V.S., Fryern Hall, Bridgwater, Somerset	2	0	0
Symon Sharp, Esq., M.R.C.V.S., Kingston House, Ash Lane, Wells, Somerset...	2	2	0
J. F. Shirlaw, Esq., M.R.C.V.S., Imperial Institute of Veterinary Research, Muktesar Kumaun, U.P., India ... ... (75 Rupees)	5	11	11
J. D. Tremlett, Esq., M.R.C.V.S., Mwanza, Tanganika Territory, East Africa	1	1	0
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James Waddell, Esq., M.R.C.V.S., Public Health Department, County Offices, Kircudbright	2	2	0
Harry McIntyre Wilson, Esq., M.R.C.V.S., 134, Bonnygate, Cupar, Fife	1	1	0
W. Colin Welsh, Esq., M.R.C.V.S., 285, Heaton Road, Newcastle-on-Tyne...	10	0	0
G. C. Webster, Esq., M.R.C.V.S., D.V.S.M., 11, King Street, Lancaster	1	1	0
T. Wilkinson, Esq., M.R.C.V.S., Greystones, Lanchester, Co. Durham	3	3	0
S. G. Wilson, Esq., B.SC., M.R.C.V.S., Ekwenderi, Nzimba, Northern Province, Nyasaland ...	5	0	0
T. Wilson, Esq., M.R.C.V.S., Barker Street, Nantwich, Cheshire	5	5	0
H. C. Watson, Esq., M.R.C.V.S., Dairy Farm, Hongkong	1,	0	0
Proceeds of Bridge Parties held by Mrs. Andrew Spreull, Dundee	17	5	0
Promises have been received from—			
Principal O'Charnock Bradley	100	0	0
Professor G. F. Boddie	25	0	0
Professor R. G. Linton	25	0	0
Professor Wm. Mitchell	25	0	0

In order to afford information as to reliable sources from which poultry stock of good quality may be obtained, the Department of Agriculture for Scotland have expressed their willingness to compile and issue a register of accredited poultry-breeding stations in Scotland. Breeders desirous of their names being included in the register are required to comply with the prescribed regulations, which are obtainable from the Secretary of the Department.

Notes and News

The Editor will be glad to receive items of professional interest for inclusion in these columns.

Diary of Events

Sept. 13th.—Meeting of the Editorial Committee, N.V.M.A., at 36, Gordon Square, W.C.1, 4 p.m.

Sept. 17th.—Meeting of North of England Division at V.O.M. Bacon Factory, Northallerton, at 1.45 p.m.

Sept. 24th.—Meeting of Southern Counties Division at Winchester, at 2.30 p.m.

Oct. 4th.—N.V.M.A. Committee Meetings.

Oct. 5th.—N.V.M.A. Council and Committee Meetings.

Oct. 6th.—R.C.V.S. Committee Meetings.

Oct. 6th.—Victoria Veterinary Benevolent Fund Council Meeting.

Oct. 7th.—R.C.V.S. Committee Meetings.

Oct. 8th.—R.C.V.S. Council and Committee Meetings.

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PERSONAL

Accident.—We regret to inform our readers that Captain W. Philipson Moss is at present detained in Woking Hospital as the result of an accident while jumping a horse at the recent Alresford Show.

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Appointments.—The Colonial Office. Messrs. D. E. Faulkner and K. D. S. MacOwan, two recent graduates, have been appointed to the Colonial Veterinary Service. The former will serve in the Gold Coast, while the latter will be posted to Kenya.

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THE BRITISH ASSOCIATION

On Thursday of last week the British Association for the Advancement of Science opened its 1937 meeting, at Nottingham.

The public business of the meeting opened with the Presidential address by Sir Edward Poulton, the veteran zoologist, whose subject was the history of evolutionary thought as recorded in the meetings of the British Association. The President restricted himself to the period with which he had personal acquaintance, beginning with the York meeting in 1881. He reminded his hearers that by that time biologists, with scarcely an exception, had accepted evolution as a fact and that before the end of the century Lord Salisbury could say that it had become part of the common beliefs of all educated people.

Scientific controversy, however, was still rife concerning the precise method by which evolution comes to pass and the problem is not wholly solved even to-day. The German zoologist Weismann clarified the position by his insistence that so-called acquired characters were not and could not be inherited. Since his time biologists had been divided into neo-Darwinians, who followed Weismann, and Lamarckians, who denied the validity of his reasoning.

Sir Edward Poulton proceeded to bring forward lines of evidence, based on his own

experience, which seem incompatible with a belief in Lamarckian evolution by means of experience. "In the relationship between enemy and prey there is very commonly no opportunity for the latter to learn by experience. The wonderfully elaborate adaptations by which sedentary insects are hidden from enemies have been evolved, not by experience of enemies but by avoidance of enemies." The protective devices by which animals escape their enemies are often incredibly efficient, as, for instance, the resemblance of various geometred caterpillars to twigs. These larvae feed only at night, and spend the day rigid, their attitude simulating a twig, their weight partly supported by a silken thread. Robert Carrick has recently shown that this disguise completely deceives hungry birds.

An example of a "prophetic instinct" is found in the maggot of an African fly: "This maggot lives and feeds in soft mud which, during the dry season when the chrysalis stage has been reached, will be traversed in all directions by wide and deep cracks in which insectivorous animals can search for prey. But the maggot, while the mud is still soft, prepares for this danger. By tunnelling spirally up and down it makes a line of weakness which will cause a pillar to separate from the mass when the mud hardens and contracts. It then tunnels into the still soft pillar and becomes a chrysalis in the centre of its deeper end. However wide the cracks which appear in the mud, the maggot has arranged beforehand that they will not invade its cylinder. . . . I would ask any believer in Lamarckian evolution, or in Hering's and Samuel Butler's theory of unconscious memory residing in the germ-cells, how it would be possible to explain these prophetic instincts, adapted not to meet but to avoid future experience, except by the operation of natural selection."

A new phase in the history of the subject was initiated by the rediscovery of Mendel's laws of heredity. The discovery that mutations are often of small extent reconciled Mendelian with Darwinian views and provided a firm basis on which mathematical deductions could be made as to the rate of evolutionary change.

The President finally referred to "the greatest of the problems with which we are faced—the end of international war," and concluded, in spite of the threatening world situation, on a note of optimism.

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Researches in Chemotherapy

Dr. F. L. Pyman, in his presidential address to the Section of Chemistry, defined chemotherapy as "the treatment of disease by chemical substances which have been shown by biological methods to be relatively much more toxic to pathogenic organisms than to human or other animal hosts." Dr. Pyman discussed the main types of chemotherapeutic drugs in detail according to the organisms they were designed to kill, and described his own work in the field of killers of amoebae, of especial value for the treatment of dysentery. A substance which at first seemed very promising had had to be abandoned; valuable hints for future work had, however, come to light in the process.

The address was followed by a symposium on the same subject. Professor Hörlein, from Germany, gave an account of the promising results achieved with certain aromatic sulphonamides on streptococcal infections, which may revolutionise the treatment of a whole group of infectious diseases. Dr. W. Kikuth, discussing the chemotherapy of malaria, said that two chemotherapeutic substances of value had been discovered—plasmoquin and aletrin. By using both of these it is now possible for the first time to break the life-cycle of the malarial parasite entirely. He considered that we were on the verge of important developments in this field which would help materially in the campaign against malaria.

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State Intervention in Agriculture

Mr. J. M. Caie, of the Department of Agriculture in Scotland, chose for his presidential address in the Agriculture Section "State Intervention in Agriculture." Mr. Caie explained that he was speaking entirely as a private individual and not as an official.

The State's total impact on the agricultural industry, he said, might be regarded under three headings: (1) Statutory compulsion enforced by penalties; (2) Statutory facilities for voluntary action, including power to compel a minority to conform to the wishes of a majority; and (3) direct or indirect assistance, financial, advisory, or protective. Government control of agriculture in this country was exercised through legislation which had to bear a very close relation to the state of public opinion in a democratically constituted State. It was not, therefore, in any sense a tyranny.

The second category of State intervention was that in which farmers were given the opportunity to organise themselves. The Marketing Acts, which were the chief examples here, were a recent institution in this country. A third way in which the State intervened in agriculture involved the State in a gross total of financial assistance to the industry (including forestry and allowing for local taxation reliefs) of over £33,500,000, from which were to be deducted £10,250,000, representing the debit caused by the action of the Wages Committees, leaving a net gain of about £23,500,000.

From his survey, Mr. Caie contended that British agriculture at present falls short of producing as much home-grown food as was possible and desirable for the nutrition of the people and for affording employment on the land to as many persons as was reasonably practicable.

If, said Mr. Caie, it was the policy of the State to preserve and support the farmer, at considerable cost to the public, was he still to be left to cultivate and crop his land, and to produce meat or milk or other products, as he thought best, without any dictation as to methods, quantity or quality? He thought that if Government aid were really made conditional on Government control, the farmer, however distasteful he found it, might be induced to swallow the pill for the sake of the gilding. At present the State differentiated somewhat in the objects of its benefactions to agriculture, and it would appear to be quite legitimate for the State to call for an increase, say, of meat, or milk, or fresh vegetables, in pursuance of, say, a nutrition policy. But if it were a permanent policy of the State to support British agriculture in general, a complete survey of the industry might be desirable, extending to the place of agriculture in the social and economic structure of the country, its present and potential capacity to meet the food requirements of the people and its relation to international trade. Such a survey might form the basis of an equitable allocation of State aid to

those branches of the industry which the public interest required to be encouraged.

The final question was whether in State aid lay the only hope for British agriculture. Although this question was of paramount importance it was one of formidable difficulty, and every wise man would hesitate to dogmatise upon it. For some at any rate there would be comfort in the belief that our farmers, given a fair share of our home markets, could once more struggle through their difficulties and maintain their position by their own initiative, energy and resource. Education and research still had many gifts in store, and if these were accepted willingly and applied diligently, was it not possible that the general standard of farming might be raised to a level beyond any but the very heaviest waves of depression? If not, agriculture was liable to become a mere hanger-on of the State, dependent on its bounty and subject to its commands.

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The Sex Ratio

As subject for his presidential address to the Zoology Section, Professor F. A. E. Crew, of Edinburgh, selected "The Sex Ratio." He began by saying that the *Statistical Review* of the Registrar-General was one of the most interesting zoological papers to appear each year, as "a progress report of a vast and exciting zoological experiment which we are conducting, scientifically or otherwise, with ourselves as the experimental material."

The chief obvious features concerning the sex ratio in this country were that more males were born than females, but that afterwards the males' death-rate was higher. The facts were explicable on the assumption that the primary sex ratio (the ratio at conception) was about 120 males to 100 females, but that the males were more delicate at all ages. In late adolescence the numbers of the sexes were equal, and in maturity the females out-numbered the males, until among people of 85 and over women were more than twice as numerous as men.

The greater delicacy of the male in man, Professor Crew believed, was an instance of a general principle applicable to the male sex in all organisms, and due to the male having a higher rate of metabolism, which made him less resistant to unfavourable conditions.

The sex ratio at birth was "an instrument of precision by which a human society may measure the quality of its structure," a yard-stick to determine the success of social services and health measures. The equality of the sexes in early maturity Professor Crew regarded as having been brought about by adaptive adjustment of primary sex ratio and differential sex mortality to give equal numbers of males and females at the optimum period for reproduction. The precise sex ratio of a species must not be regarded as a biological accident, but as a delicate adjustment of contrary forces brought about by selection during the course of gestation.

The address was followed by a discussion in which Dr. Walton, of Cambridge, gave an interesting review of possible methods by which the sex ratio could be experimentally controlled. In mammals the most promising line of attack is to find some means of separating male-determining from female-determining sperms. This is theoretically possible, and, if successful, would be of enormous economic importance in stock-breeding as well as opening up quite new vistas in human biology.

Pasture Improvement

Dr. R. E. Slade, of Imperial Chemical Industries, speaking on the subject of "Grass and the National Food Supply," said that since the War much progress had been made in regulating the amount and quality of stock food available on pastures by controlling the grazing and by the use of manures. Since 1935 an investigation had been proceeding on a Cheshire farm to determine the amounts of crude protein obtained each month as grass for grazing, as hay, as dried grass, and as ensilage. From these data the nutrients eaten by the stock had been calculated, and the totals for both 1935 and 1936 represented three to four times as much animal food per acre as was obtained on the average grass farm in this country.

The yield per acre of crude protein, 700 lb., was equivalent to a yield of 45 lb. as dressed beef, or to 300 gallons of milk. Pigs fed on grass protein could provide 70 lb. of pork per acre, but grass was too fibrous for feeding in quantity to pigs. To-day, therefore, we needed a protein-rich food made from grass containing little or no fibre—a kind of "grass-cheese," which would make a very useful food for pigs. Then the 9,000,000 acres of arable land in this country, if put down to grass, might produce enough "grass-cheese" to feed 40,000,000 people, leaving our permanent pastures and rough grazing to keep our cattle and to supply meat and milk as extras.

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Animal Experimentation

Dr. E. P. Poulton, President of the Physiology Section, headed a party which visited the works of Boots Pure Drug Co., Ltd. In thanking the firm for arranging demonstrations he said he had found out that all the scientific workers in the biological department of the works had vivisection licences, which meant that the fight for vivisection had been won. When the public realised that their health depended on its routine practice they would never agree to its abolition, though they might if it was used only for experimental research.

Considering how essential the dog was for certain experiments, though practically never of a painful nature, the public had but the vaguest idea of what vivisection really was or how its practice had altered of recent years. He wished that the chemical firms might find this animal also essential for some of their experiments, and then we should be spared the dogs Bills which were introduced so frequently into Parliament, which required scientific men to devote so much time to their opposition.

(*To be continued.*)

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LEGAL NOTES

Sheep Dip Under Strength.—Sidney John Cruwys, farmer, of Sherwood Barton Farm, Sidmouth Junction, was summoned at Honiton recently for failing to use sheep dip of a required strength.

Sergeant Eddy said he was informed 484 sheep were to be dipped at Sherwood Barton. He saw about 110 pass through the dipping bath, and then asked Mr. Cruwys to stir the bath for samples to be taken. One sample was returned by the county analyst on July 31st with a report stating it was under strength.

Mr. W. G. E. Quick, agricultural analyst, said there was a deficiency of about a third in soluble arsenic.

Mr. Templeman said that was not a serious deficiency of soluble arsenic in the dip, and defendant had taken the trouble to send notice to the police. He was merely obliging farmers by dipping the sheep, and had no intention of deliberately using a weak dipping mixture.

The Chairman said the Bench were satisfied defendant, and, in fact, most farmers, would be the last to go against the regulations deliberately.

Cruwys was fined 10s. and costs.

Walter Heyman Collins, of Hale Farm, Honiton, was summoned for a similar offence.

Sergeant Eddy said he saw 40 sheep, the property of Mr. Reed, of Holmsleigh, Monkton, pass through the bath, and took a sample, which on analysis was certified to be under strength. In consequence witness had to withdraw 200 sheep from Honiton Fair. Defendant said the dip was prepared according to directions the same as had been done for years. It had always previously been all right.

In reply to the Chairman, Mr. Quick (the county analyst) said approximately half of the samples he received contained an excess of arsenic, but so far as he was aware no sheep had died.

Collins was fined 10s. and costs.

Correspondence

Letters to the Editor should reach the Office not later than by the first post on Tuesday morning for insertion in following Saturday's issue.

All correspondence must bear the name and address of the contributor for publication.

The views expressed in letters addressed to the Editor represent the personal view of the writer only and must not be taken as expressing the opinion or having received the approval of the N.V.M.A.

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GRASS TETANY

To the Editor of the Veterinary Record

Sir,—I was interested in a paper on "Some Recent Advances in Veterinary Therapeutics and Diagnosis of Special Interest to the Practitioner" by Professor T. G. Browne, M.R.C.V.S., published in your issue on August 7th, 1937.

Under the heading of Grass Tetany, Professor Browne states no known remedy is available for this condition.

I have used the following preparation in numerous cases with most excellent results even when the beast has been down in a state of convulsions.

℞ Magnesium Chlorate ʒiv.
Calcium Chlorate ʒi
Warm Distilled Water 200 c.c.

This is injected intravenously *via* the jugular vein and it is seldom that a second injection is necessary. The cow is usually up and walking about within an hour.

The injjection into the vein is given very quickly using a 200 c.c. Neilsen syringe and a large bore needle. With a beast in convulsions the need for speed is obvious. No trouble has been experienced, so far, in injecting quickly into the vein.

Yours faithfully,
C. R. A. Powell.

1, Brook Street,
Luton.

September 6th, 1937.

HYSTERIA AND ALLIED CONDITIONS IN THE DOG

To the Editor of the Veterinary Record

Sir,—While I am, at all times, unwilling to lift my pen in controversies, publication of the Papers and Discussion upon "Hysteria and Allied Conditions in the Dog," by members of the North of England Division, N.V.M.A. (*Vet. Rec.* 49. 35. 1108-1113) prove so provocative that I needs must.

Terminology: Hysteria. While the application of this term, which at first sought to indicate a particular disease in women, which was characterised by lack of control over acts and emotions, etc., etc., has been extended to include hysteria-like conditions in man, and, more recently, dogs, an extension which appears to have awakened a certain degree of resentment in the minds of etymologists, might I suggest that, not only is the term aptly descriptive of the condition which concerns us, but, being an "active" word its retention is justified?

Symptomatology: From experience I would say that the condition is typical and readily distinguishable. Its symptoms may be summarised—following a more or less definite time interval as from the ingestion of a prepared cereal which contains a toxic principle which, in turn, appears to have an elective action upon the vegetative nervous system, the animal shows apprehension, paralysis of occular accommodation, hypertonus of the vocal cords (a tonus which gives rise to increase in pitch of voice), tachycardia, swift flight, yet showing good co-ordination, with urination and defaecation invariably present. Temperature is normal or very slightly elevated at most, being, in quality and behaviour, in keeping with an energy temperature.

Predisposing Factors: Observation has not taught me to regard, singly or collectively, pedigree, age, sex, locality, work, nor varied domestic circumstances as predisposing factors.

Aetiology: There is every reason to believe that the condition is neither infectious nor contagious, nor, again, communicable as an emotional state to otherwise fed dogs placed in the closest proximity. As regards inoculability, it will be appreciated that any attempts to reproduce the condition *via* inoculating materials is outwith the licence of a clinician, therefore, investigation in this direction remains with others. However, from observation it is conceived, and from results contended, that this distinguishable condition is begotten dietetically through feeding a prepared cereal which contains a toxic principle.

In support of the above the following is advanced. In the course of treatment for other diseases the parenteral administration of sugars, even beyond saturation point, does not give rise to any condition comparable to the condition in question—that and other considerations rather tend to negative the toxic principle being contained in the sugars or derivatives thereof. One's mind is, therefore, focused upon the protein content of cereals. It is known that protein in the process of reduction to amino-acids gives rise to toxic substances, principally contained in the polypeptide groups. It is also known that, apart from other changes in the course of preparing a cereal food-stuff by baking or cooking, an autolysis is induced in the protein of the cereal. It is my suggestion that this autolysis is not only marked in some batches but that the reduction is arrested whilst toxic polypeptides are present in appreciable quantities. Accordingly,

is it unreasonable to suppose that we are introducing some batches *via* a definitely toxic substance which appears to undergo no further reduction in the presence of enzymes *in vivo*, and, that it is absorbed as such, thence showing an elective action upon the vegetative nervous system as is expressed in a constant train of symptoms. To my mind this elective action is as dramatic as Langley's Nicotine Method upon the same system. Are we, then, dealing with a form of anaphylaxis?

The following have also been noted:—

(1) The condition has been produced at will by feeding incriminated material.

(2) That a definite time interval has been observed as from the time of ingestion of a batch known to give rise to the condition until the manifestation of the first symptom.

(3) Neither prolonged boiling, age nor methods of keeping appear to influence its potency.

(4) Feeding varied amounts suggests that it is more qualitative than quantitative.

(5) Neither tolerance nor immunity appear to be established.

Treatment: The immediate discontinuance of feeding a prepared cereal to an animal which is essentially a carnivore, be the food-stuff porridge, bread (white or brown), meals or biscuits.

In conclusion I would most respectfully invite Professor T. Dalling to record the results of recommendations which I had the honour to make to him during an outbreak amongst a number of animals which were under his supervision in July, 1932. I am sure that report from our learned colleague would enrich our knowledge in this direction.

Yours faithfully,

GEORGE DYKES.

202, Wedderlea Drive,
Glasgow, S.W.2.

September 1st, 1937.

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CONVULSIONS IN A KITTEN

To the Editor of the Veterinary Record

Sir,—My attention has been drawn to a clinical contribution in your journal (p. 925) entitled "Convulsions in a Kitten." I should think chloral is about the last thing to give in a case of delayed chloroform poisoning. Chloral and chloroform are similar in action; indeed chloroform is made from chloral.

BERNARD GORTON.

22, Arnewood Road,
Bournemouth,
Hants.

September 1st, 1937.

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PROSPECTS IN THE R.A.V.C., T.A.

To the Editor of the Veterinary Record

Sir,—I have been asked by several younger members, wishing to take Commissions in the R.A.V.C. Territorial Army what are the prospects, owing to the extensive mechanisation of the Territorial Army.

During annual training with my Division this year I had an opportunity of discussing the matter with the Director-General of the Territorial Army, General Sir Walter M. St. G. Kirke, K.C.B., C.M.G., D.S.O.

I am enclosing his letter to me, which will be of interest to younger members wishing to join the T.A., in the hope that you will kindly publish it.

Yours faithfully,

J. SCOTT-BOWDEN.

Beulah,
Colwall,
Malvern.

September 4th, 1937.

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Dear Colonel Bowden,

I have been looking into the prospects of the R.A.V.C., T.A., and I feel that owing to the present curtailed need for veterinary officers in the Territorial Army, young veterinary surgeons who wish to join the Territorial Army would be well advised to take commissions in other branches of the service. In the event of hostilities, should more officers be required for the Royal Army Veterinary Corps, Territorial Army, these officers could transfer as occasion arose. . . .

Yours sincerely,

WALTER KIRKE,
General, D.G., T.A.

WAR OFFICE.

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"PRONTOSIL"

To the Editor of the Veterinary Record

Sir,—At the present moment Prontosil, a drug used in the chemotherapy of bacterial infections in man, is very much in the medical limelight. This drug was introduced by German workers and it has been found to have a remarkably specific effect on streptococcal (group A) infections in women suffering from puerperal fever. It also seems to give promising results in meningococcal infections and in infection of the urinary tract with *Bact. coli*.

Unfortunately, the drug is now being used generally and somewhat indiscriminately in all sorts of infections, very often without the bacterial cause of the condition being ascertained, and a number of so-called cures of single cases have been reported in a variety of conditions.

The drug is now available to the veterinary profession and it is an opportunity for us by extensive clinical trial with adequate controls to prove whether the drug is efficacious and not just to form opinions that it may be useful, which is all we shall be in a position to do if we use the drug haphazardly. It is rather essential that when it is possible the bacterial cause of the condition being treated should be confirmed.

The drug should be used with discretion: one or two cases in man have developed a haemolytic anaemia, and one case had a severe attack of agranulocytosis. These were probably cases of individual idiosyncrasy.

Yours faithfully,

D. L. HUGHES.

74, Draycott Avenue,
Kenton, Middlesex.

September 6th, 1937.